TECHNICAL REPORT

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A HUMAN FACTORS SURVEY OF ARMY TENTAGE

by

F. Thomas Eggemeier

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and

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April 1974

UNITED STATES ARMY
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Natick, Massachusetts 01760

Food Sciences Laboratory

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A questionnaire designed to identify general areas of functional significance critical to performance of tentage in the field and to provide evaluation of current tentage with regard to a number of specific factors, such as environmental protection and space, was administered to a panel of 96 respondents.

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Repair of Tents
Tents
Tent Design
Tent Erection
Tent Habitability
Tent Materials
Tent Packing
Tent Performance
Tent Size
Tent Striking
Tent Weight

20. (Cont'd)

Results of the questionnaire identified three major areas of functional concern related to the panel's satisfaction with performance of tentage in the field: 1) adequacy of environmental protection; 2) adequacy of space; and 3) ease of erection, striking, and packing. Evaluations of some current tentage with respect to these general areas and the specific factors which contribute to them have been provided, in addition to suggestions and opinions from the panel regarding optimal design, materials, and some proposed innovations.

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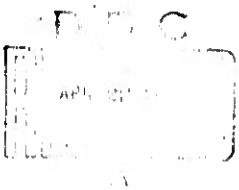

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FOREWORD

The study reported here was conducted by the Human Factors Group, Behavioral Sciences Division, Pioneering Research Laboratory, at the request of the General Equipment and Packaging Laboratory. This work was done under Project 1J662713DJ40, Structural Mechanics of Tentage under Task 07, Studies to Improve the Habitability of Field Shelters, Work Unit 001, Human Factors and Research in Support the Development of a Tent or Tents for Two to Ten Men Suitable for Back Packing. Elements of the Pioneering Research Laboretory have now been incorporated into the current Food Sciences Laboratory.

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ABSTRACT

A questionnaire designed to identify general areas of functional significance critical to performance of tentage in the field and to provide evaluation of current tentage with regard to a number of specific factors such as environmental protection and space was administered to a panel of 96 respondents.

Results of the questionnaire identified three major areas of functional concern related to the panel's satisfaction with performance of tentage in the field: 1) adequacy of environmental protection; 2) adequacy of space; and 3) ease of erection, striking, and packing. Evaluations of some current tentage with regard to these general areas and the specific factors which contribute to them have been provided in addition to suggestions and opinions from the panel regarding optimal design, materials, and some proposed innovations.

INTRODUCTION

In providing human factors support of the U.S. Army Natick Laboratories functional field shelter program, it was determinad thet systematic information regarding particularly positive or negative espects of current field tentage would be of importance in such an effort. Such information would permit specification of features to be retained in future tentage end would provide e means of identification of significant problem areas warranting further investigation during prototype development. In an attempt to develop such information, e questionnaire concerning portable field shelters was prepared for administration to e panel consisting of e relatively limited number of military and civilian personnel with varied experience with tentage. The purpose of the questionnaire was basically twofold: 1) to identify generel areas of functional significance critical to performance of shelters in the field; and 2) to provide evaluation of current tentage with regard to a number of specific factors related to such areas as habitability, space, and environmental protection.

Method

A draft interview guide end questionnaire consisting of approximately 100 test items dealing with various espects of the design and use of Army tentage was developed and administered to e group of seven individuals, e number of whom hed hed design or field experience with tents end a number of whom were experienced in design end administration of questionnaires end surveys. Based upon en analysis of the information content of the designer end user responses and e critique provided by the designers, users, end survey experts, the questionnaire was modified end e revised questionnaire was developed and administered to the actuel panel.

The revised questionnaire included e personel data sheet relavent to experience in design and use of tents, two criteria lists which were applicable to man-portable shelters, and e series of thirty-one short-answer and multiple-choice questions dealing with the design, materials, end use of e number of sizes of tents. Short-answer questions were included in order to permit the panel's expert tent designers and users maximum freedom in expressing opinions and offering suggestions concerning the tents. A complete copy of the revised questionnaire is included in the Appendix.

The questionnaire was satisfactorily completed by a total of 96 respondents. Table 1 presents the number, type, end organization of various segments which constituted this 96 person panel.

The panel was composed of both military end civilian expert designers end users. The military varied in their rank, branch of service, and tentage experience. The civilian

Table 1

Number, Grade, Branch, and Organization of Respondents

Who Completed the Questionnaire

No.	Grade	Branch, Occupation, or Specialty	Organization
7	Enlisted Men	10th & 12 Special Forces Airborne	—Ft. Devens,
18	Enlisted Men	842 Engineering Co.	MA
4	Field Grade Officer	Infantry	
22	Company Grade Officers	Infantry	
4	Warrant Officer	R&D	
15	Enlisted Men		—US Army Material Commend Infantry R&D Liason Office Ft. Benning, GA
4	Company Grade Officers	Engnr.	
8	Enlisted Men	Engnr.	
1	Civilian		
1	Field Grade Officer	QMC	—US Army Natick Labs
1	Company Grade Officer	AGC	Natick, MA
1	Enlisted Man		
5	Civilian	Tent manufacturers	
5	Civilian	Mountain climbers	
Total 96			

members of the panel were for the most part, experts, represented by a tent manufacturers' trade association and a group of campers and mountain climbers from a Northeast region mountain climbing club. The questionnaire was completed by the various segments of the panel during the period December, 1972, through March, 1973.

Results and Discussion

The results section is divided into the four major subject categories dealt with in the questionnaire itself. The major categories include: 1) Criteria and Preferences – an analysis of responses to questions designed to identify those characteristics of tents which the panel considered of primary importance; 2) Environmental Protection and Space – a summary of responses to questions which dealt with the adequacy of environmental protection and the space afforded by several sizes of tents; 3) Human Factors and Habitability – an analysis of questions related to use and handling and to other habitability factors of various sizes of tents; and 4) Design, Materials, and Repair – a number of questions which sampled opinion regarding the optimal support, materials, and repair items to be used in tents. The complete copy of the questionnaire in the Appendix can be used to obtain further information regarding the exact wording and format of each of the questions discussed in this section. To facilitate reference to the Appendix, each question is identified by its questionnaire number as it is discussed.

SECTION I

Criteria and Prefarences

The primary purpose of the questions included in the criteria and preference section was identification of those characteristics of tents, whether military or civilian, which the panel considered to be of major importance in a tent designed to be back-packed. Identification of these critical characteristics was undertaken in two ways: (1) through panel ratings on numerous criteria judged on an *a priori* basis as principal tentage design considerations and (2) through requiring the panel to identify those characteristics of both civilian and military tentage which they had liked or disliked most or which needed improvement to upgrade the functional performance of tents in the field. The critical characteristics identified through the criteria method will be reported first followed by a report of those characteristics which emerged in the analysis of the major likes and dislikes concerning tentage.

Criteria

Twenty general criteria applicable to tents designed to be back-packed were listed in the first criteria section of the questionnaire. Each respondent checked what he

considered the eight most important of the criteria. Each respondent then double-checked the four most important of the eight criteria checked initially. The total number of times each criterion was checked served to indicate the panel's opinion of its relative value or importance. Table 2 lists the criteria in rank order with the corresponding score obtained. Comparison of raw scores gives some perspective of the magnitude of the differences between ranks. The scores can be categorized into the four groups indicated by the spaced sections in Table 2: 100 and above, 45 through 99, 25 through 44, and 0 through 24. Each of these groups includes approximately one quarter of the statements and provides a convenient means of generally classifying the importance of a tent characteristic to the sample. The criteria listed in the first group (light weight, small bulk when folded for carrying, ease of erection, protection from environmental stresses, and adequate space) appear to be of major importance to the sample by virtue of their high rankings. The other criteria fall into three groups in decreasing order of importance.

There was little difference in the ranking of the general criteria by the engineer, infantry, and special forces members of the military panel or between the military panel as a whole and the expert civilian panel. The Spearman rank order correlation between segments of the military panel was very high (r_s = 0.93), as was the correlation between the military panel as a whole and the civilian panel (r_s = 0.86).

In addition to rating the relative importance of twenty general or global characteristics of back-packed tents, respondents were also asked to state their preferences regarding more specific criteria applicable to tents designed to be back-packed. Respondents checked the sixteen most important of forty specific criteria listed for a tent that was to be back-packed. Respondents were then asked to double check eight of their original sixteen choices in order to indicate which among the original sixteen were considered by them to be the most important design and functional considerations. The total number of times each criterion was checked, therefore, served to indicate the sample's opinion of its relative value or importance. Table 3 lists the specific criteria in rank order in addition to the check score obtained for each.

Inspection of Table 3 indicates that protection against rain was rated most important of the specific criteria listed, followed in the rankings by ease of erection in the dark and the provision for warmth in the cold. Seven of the ten most highly ranked items were related to the adequacy of environmental protection afforded by a tent, one with adequacy of space, one with ease of erection, and one with ease of back-packing a tent.

Favorable and Unfavorable Aspects of Tentage

In Question 1, each respondent was asked to list two or more things that he liked best about the 2 man, 4–6 man, 10 man, and larger sizes of tents which he had used. Fig. 1 presents the percentage of responses falling into each of three major categories

Table 2

General Criteria for Tents Designed for Back-Packing

Rank	Total Score	Statement
1	157	Light weight, even when wet.
2	125	Small bulk when folded for carrying.
3	113	Easily and quickly erected and struck with available tools.
4	108	Protects soldier against environmental stresses.
5	100	Right size for the number of occupants, their gear, and the functions to be performed in the tent.
6.5	61	Easy exit in case of fire or attack.
6.5	61	Tent is stable in the wind.
8	55	Adequate ventilation, even in rainy weather.
9	50	Tent material is flame resistant.
10	49	Tent is durable enough for six months continuous field use.
11	48	Convenient to handle and adjust.
12.5	40	Easy to maintain and keep clean.
12.5	40	Affords or permits suitable camouflage, world-wide.
14	37	Tent is suitable for many uses.
15	30	Protects stowed equipment from damage by the environment.
16	12	Small bulk when packaged for shipping.
17	11	Adequate blackout provisions.
18	10	Illumination is adequate for activites to be performed in the tent, day or night.
19	4	Tent materials do not complicate wounds.
20	3	Tent has good military appearance.

Table 3

Specific Criteria and Design Features for Tents Designed for Back-Packing

Rank	Total Score	Statement
1	133	Tent protects soldier against rain.
2	119.5	Tent can be erected quickly, even in the dark.
3	118	Tent helps to keep soldier warm in the cold.
4.5	106	Tent protects soldier against wind.
4.5	106	Tent protects soldier against mosquitoes and other insects.
6	97	Tent protects soldier against snow.
7	86.5	Tent is compatible with standard load-carrying equipment.
8	83	Tent protects soldier against ground water.
9	80	Tent has maximum inside space, unobstructed poles.
10	78.5	Tent floors are waterproof and durable.
11	71.5	Tent can be erected on any terrain
12	70	Minimum increase in weight when tent is wet.
13	69.5	Tent is easy to patch and repair.
14	69	All tent materials are highly water repellent, but the walls breathe to prevent condensation.
15	59.5	Tent helps to keep the soldier cool in heat and sunshine.
16	59	Tent has minimum number of stakes and ropes.
17	46.5	Tent closures work reliably at extreme sub-zero temperatures.
18	45	All tent poles or frame members are standard and maximally interchangeable.
19	43	Tent fabric remains flexible at extreme sub-zero temperatures.
20	41	Tent has two exits.

TABLE 3

Specific Criteria and Design Features for Tents Designed for Back-Packing

Rank		
21.5	36	The physical characteristics of the tent material are minimally effected by long periods of outdoor exposure.
21.5	36	Tent provides for cross ventilation, when needed.
23	31	All hardware, tent pegs, and other parts are "captive" to prevent loss.
24.5	30	Tent closures are easy to operate with arctic handwear.
24.5	30	All other tent hardware and parts are standard and interchangeable.
26.5	29	Tent material is free from unpleasant odors.
26.5	29	The tent material is mildew resistant.
29.5	28	If the tent has a floor, there is a drain or zippered opening in the floor.
26.5	26	All hardware, closures, and small parts are lightweight.
30	24	Tent protects soldier against snakes.
31.5	20	All hardware, closures, and small parts are corrosion resistant.
31.5	20	Tent hardware and parts do not become brittle, even at extreme sub-zero temperatures.
33	17.5	Shock-cord suspensions are used to improve the resistence of tent to wind.
34.5	15	The weight and strength of tent materials are minimally affected by processing, finishing, and treatments.
34.5	15	Tent has no unfavorable impact on occupants.
36	11.5	Tent furnishes desirable visual environment.
37	10.5	Tent provides for drying clothes inside.
39	10	Tent is quiet.
39	10	Tent can be moved from place to place, fully assembled.
39	10	Color inside the tent is not objectionable to users.

of tentage considerations which emerged in the analysis of responses to this particular question. Percentage responses are presented for each size of tent included in the question. It should be noted that the percentages indicated are based upon a different number of responses for each size of tent due to different numbers of positive responses regarding the tents and to different amounts of experience with the tents. Respondents were given the instruction to omit any item on the questionnaire which required information outside of their particular experience with tents.

Favorable and Unfavorable Aspects of Tentage

In Question 1, each respondent was asked to list two or more things that he liked best about the 2 man, 4–6 man, 10 man, and larger sizes of tents which he had used. Fig. 1 presents the percentage of responses falling into each of three major categories of tentage considerations which emerged in the analysis of responses to this particular question. Percentage responses are presented for each size of tent included in the question. It should be noted that the percentages indicated are based upon a different number of responses for each size of tent due to different numbers of positive responses regarding the tents and to different amounts of experience with the tents. Respondents were given the instruction to omit any item on the questionnaire which required information outside of their particular experience with tents.

It is obvious from Fig. 1 that different sizes of tents varied considerably in their positive aspects as perceived by the panel. The 2 man tent is viewed as strong in ease of erection, striking, and packing, but weaker with regard to adequacy of environmental protection and space. On the other hand, the 4–6 man, 10 man, and larger tents are viewed as stronger in the area of protection from the elements, but somewhat weaker in the ease of erection, striking and packing and with regard to adequacy of space afforded. Table 4 in the Appendix outlines more specific comments made by respondents in each of the three major areas. Principal among the specific positive features of the 2 man tent were its light weight and the ease with which the tent could be erected. Among the features of the 4–6 man tents, the principle positive comments related to their waterproof characteristics, ease of erection, and the room which they afforded. With respect to 10 man tents, positive aspects cited frequently were their warmth and ability to be heated, the room afforded for personnel and equipment, and their ease of erection. Larger tents were cited specifically for their warmth and ability to be heated, the protection afforded from the rain, and the adequacy of space provided for personnel and equipment.

Fig. 2 presents the percentage of responses falling into each of three major categories which emerged in an analysis of responses to Question 2. This question required that the respondent list two or more factors that he disliked most about each size of tent that he had used. Percentages listed for each tent size are once again based upon different

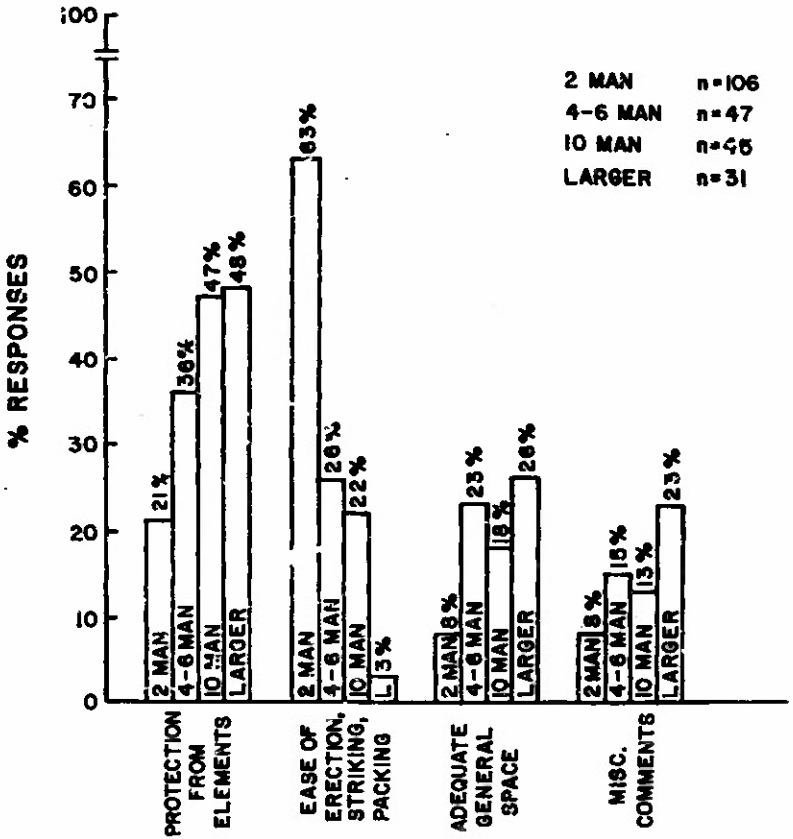

FIG. I PERCENTAGE OF RESPONSES IDENTIFYING PARTICULAR ASPECTS OF TENTAGE AS THOSE LIKED BEST

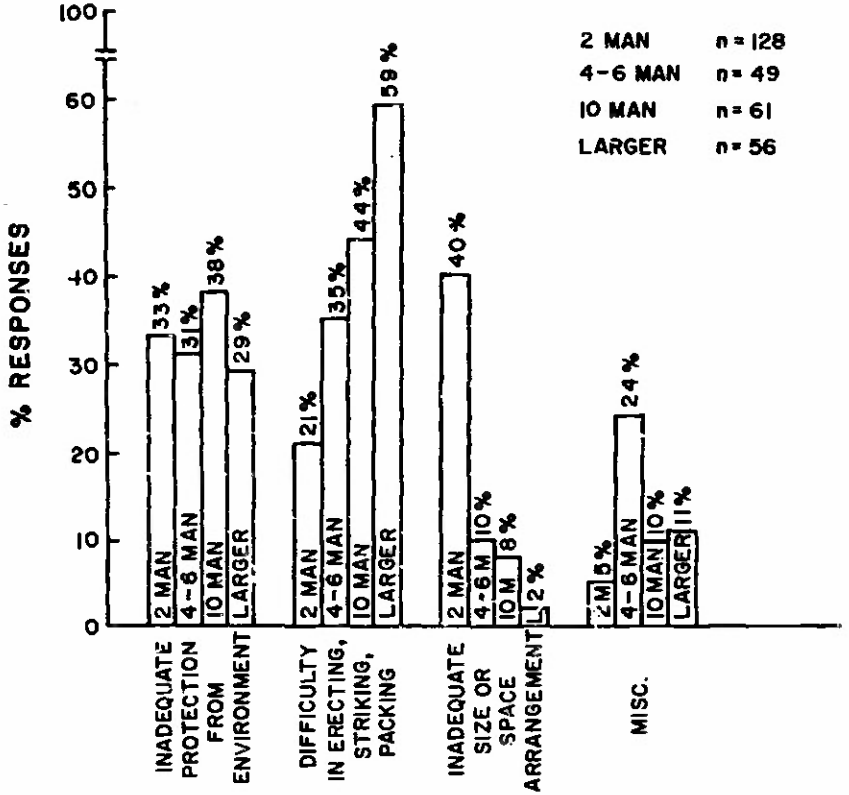

FIG. 2 PERCENTAGE OF RESPONSES IDENTIFYING PARTICULAR ASPECTS OF TENTAGE AS THOSE DISLIKED MOST

numbers of responses, due to differences in the number of complaints regarding an item and to differences in experience among respondents with particular sizes of tents.

Of interest in Fig. 2 is that the three major subject areas which emerged in the analysis of responses to Question 2 represent the same areas of concern which emerged in the analysis of Question 1: adequacy of environmental protection; ease in erection, striking, and packing; and adequacy of size or space arrangements. It is once again obvious that the pattern of response distribution varies somewhat with the size of the tent under consideration. While all sizes of tents were criticized in approximately the same percentage of responses for inadequate environmental protection, there are obvious progressive increases in difficulties related to erecting, striking, and packing and progressive decreases in complaints regarding inadequate space as larger sizes of tents are considered. Table 5 in the Appendix presents a more detailed summary of the specific complaints which were cited in each of the major categories outlined in Fig. 2. Principal among the specific complaints related to inadequacy of environmental protection in the 2 man tent were the complaint that it leaked or was not waterproof and that it provided no floor for protection against ground water. The general comment that the space afforded in the 2 man tent was inadequate for personnel and gear was also a common one, as was the observation that the tent was too heavy for erection, striking, and packing.

A considerable degree of unanimity was present in the specific complaints noted with respect to the 4–6 man, 10 man, and larger sizes of tents. Concerning problems in erecting, striking, and packing of tents, all were considered too difficult or too complex to erect, and too heavy and bulky for ease of these functions.

With regard to inadequacy of environmental protection, the principle complaint lodged against the larger tents concerned their becoming too hot in the sun or their inadequate ventilation.

In order to further evaluate each of the sizes of tents studied, those characteristics which were liked best were compared with those which were liked least. While Fig. 1 permits comparison among various tent sizes on those aspects of tentage liked best and Fig. 2 permits the same comparison on those aspects of tentage disliked most, it is not possible to directly compare the same tent size on those aspects liked most and those disliked most on the basis of Figs. 1 and 2. This is due to the sample size correction applied by employing percentage of response data and the fact that already noted differences in sample sizes do exist. Fig. 3, based upon the absolute number of responses, does permit this same size comparison for the four major subject areas already outlined in Figs. 1 and 2.

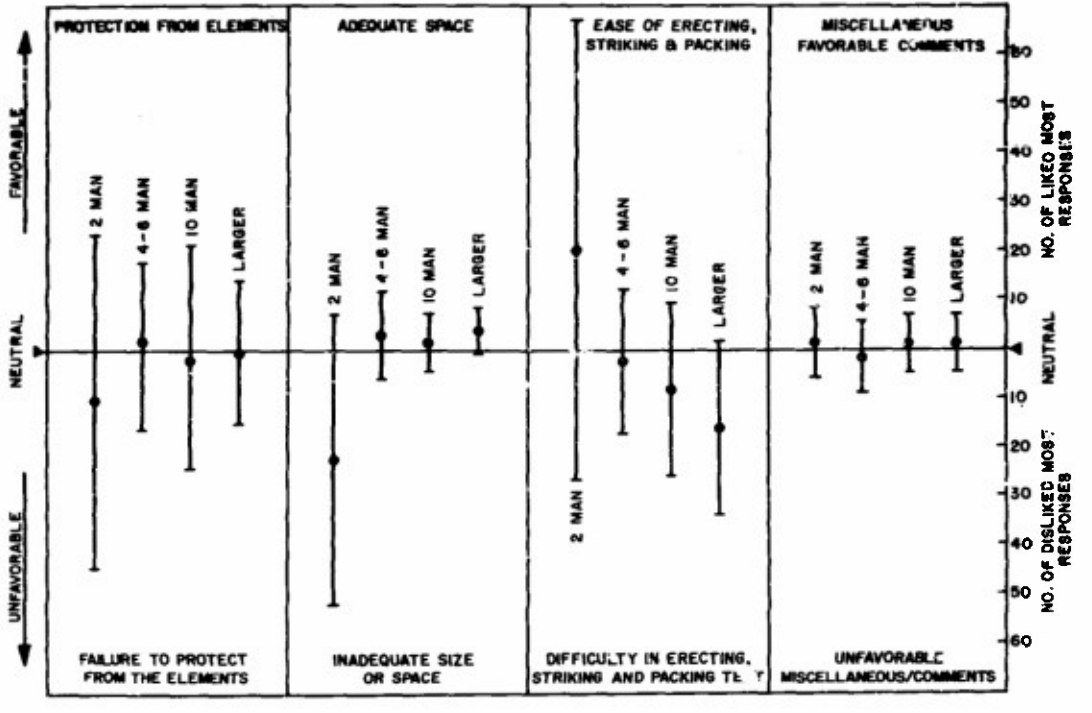

FIG. 3 COMPARISON OF FAVORABLE AND UNFAVORABLE RESPONSES WITHIN TENT SIZES IN MAJOR AREAS OF CONCERN

In Fig. 3, the number of responses expressing a "liked best" characteristic about each size of tent is plotted above the horizontal neutral line, while the corresponding number of responses expressing a "disliked most" opinion regarding the same characteristic is plotted below the horizontal neutral line. The midpoint of each response comparison is indicated for each size of tent in each category, and serves to indicate the relative favorable or unfavorable position held by each size of tent with respect to each characteristic. It should be emphasized that, unlike the results of Figs. 1 and 2, the results in Fig. 3 do not permit legitmate magnitude comparisons between tent sizes but do permit such comparisons within a particular tent size.

Analysis of Fig. 3 indicates that, with respect to protection from the environment, the 2 man tent is the only appreciable instance of departure from neutrality, and that in the negative direction. This indicates that the panel generated a greater number of unfavorable comments than favorable ones concerning the 2 man tent's ability to protect an individual from the environment and serves to indicate a degree of dissatisfaction, relative to satisfaction, with regard to this factor. With regard to adequacy of space and size afforded, the 2 man tent represents the only instance of an appreciable degree of dissatisfaction, while the larger sizes of tents were judged somewhat favorably in this respect. In the analysis of ease of erecting, striking, and packing responses, the results favored the smaller tents and were, in general, inversely related to the size of tent. Finally, it is evident from Fig. 3 that the number of miscellaneous favorable and unfavorable comments were approximately the same for all four tent sizes.

In an effort to obtain information concerning additional tentage inadequacies which might not have previously been specifically addressed in the questionnaire, Question 26 required respondents to list any ways not previously mentioned in which they thought the tents which they had used could be improved.

It had been anticipated that responses to Question 26 might be quite different from those obtained in response to the questions regarding the liked best and disliked most aspects of tentage (Questions 1 and 2). However, analysis of the data indicated that responses were once again aligned in terms of the three major subject categories that appeared in the analysis of Questions 1 and 2. This is considered significant in that it further substantiates the conclusion that can be drawn from Figs. 1 and 2 – namely that this particular panel, even when asked to name areas not noted previously, identified three major areas of concern regarding tentage: 1) environmental protection; 2) ease of erecting, striking, and packing; and 3) adequacy of space. Fig. 4 represents the percentage of responses falling into each of the four subject areas.

It is clear from Fig. 4 that the pattern of results is quite similiar to that observed in Fig. 2 (the Disliked Most Analysis) with respect to the ease of erection and space

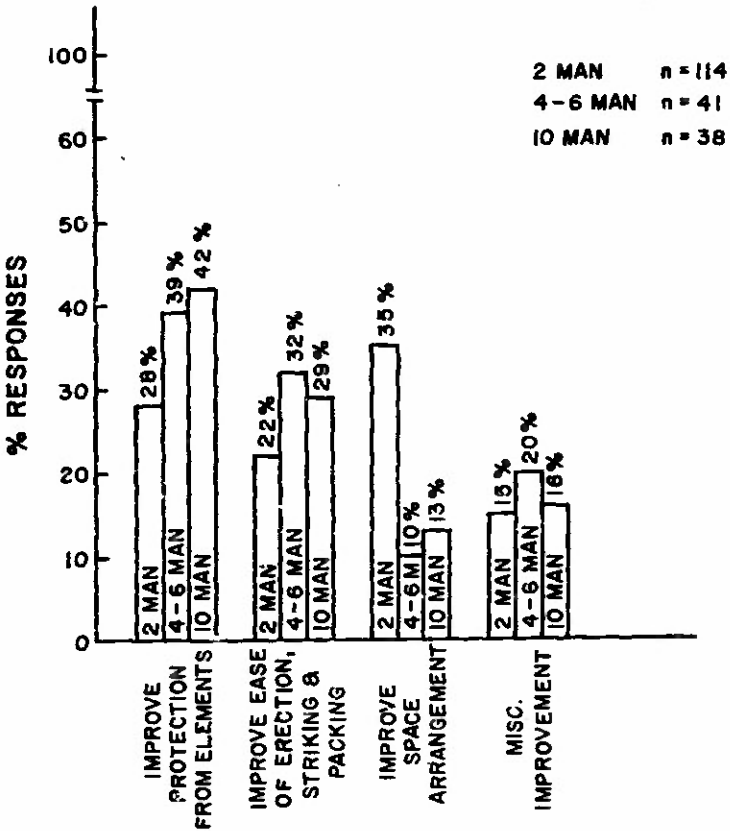

FIG. 4 SUGGESTED AREAS OF IMPROVEMENT NOT CITED PREVIOUSLY IN THE QUESTIONAIRE BY RESPONDENTS

adequacy factors. In both analyses, the 4–6 and the 10 man tents were rated as less convenient to erect, strike, and pack than were their 2 man counterparts. Likewise, both analyses indicate that the adequacy of space in the 4–6 and the 10 man tents was judged to be superior to that of the 2 man tent. With respect to the adequacy of environmental protection, the analysis of responses to the present question indicates a greater proportion of suggestions for improvement of both larger tents than for the 2 man, while the analysis presented in Fig. 2 had indicated an approximately equal percentage of complaints for all three sizes of tents. The reason for this discrepancy is not clear from the data. It might be hypothesized, however, that intervening questions which appeared between Questions 2 and 26 may have served to stimulate further comments regarding environmental protection in larger tents.

Section Summary

As indicated previously, the major purpose of this section was to identify the principal characteristics or functional areas considered critical in field shelters by the panel. Through an analysis of reports of those aspects of tentage liked best, those disliked most, and those which might be further improved, three major critical areas of general panel concern were identified: 1) adequacy of protection from the environment; 2) ease of erection, striking, and packing; and 3) adequacy of space afforded by the tent for personnel and equipment. In an overall analysis which weighed the number of positive and negative comments concerning each major area it was found that: 1) 2 man tents were generally judged to be lacking in environmental protection and adequacy of space afforded and other sizes of tents were considered to be essentially neutral in this regard, and 2) 2 man tents elicited positive responses with respect to ease of erecting, striking, and packing and larger tents were judged to be progressively less satisfactory in this regard as tent size increased.

Results of the general criteria section supported the conclusions drawn above regarding the three areas of major functional significance with ease of erection and striking, protection from environmental stresses, and correct size for occupants and gear rated among the five most important general criteria. The lack of two top rated specific criteria (light weight and small bulk) were identified by respondents in the "disliked most" analysis as major contributing factors to the principal problem area identified with larger tents – ease of erection, striking, and packing.

SECTION II

Environmental Protection and Space

In an effort to evaluate the adequacy of the environmental protection and space afforded by current tents, respondents were asked a number of questions dealing with

each of these factors. This section of the report will first review the results of those questions dealing with the environmental protection afforded by current tents and will then consider those responses relevant to the adequacy of space provided.

Environmental Protection

Question 3 in the survey listed seven environmental conditions and four sizes of tents and required respondents to specify if any of the tents had failed to adequately protect them from any of the environmental conditions listed. Both the absolute number and corresponding percentage of times each tent was reported as being inadequate under each environmental condition are listed in Table 6. Table 6 also lists the total number of failures reported for each tent size, the number of respondents who indicated they had had pertinent experience with each size tent, and the mean number of failure reports per eligible respondent. While Table 6 permits many comparisons, the mean number of failure reports per eligible respondent represents an overall index of failure to provide environmental protection corrected for the unequal number of respondents with experience in each type of tent. Based upon this index, there were substantial differences between tents in the protection they afforded. The 2 man tent was cited for the largest number of mean failures (2.40), followed by the 10 man tent (1.27), the larger tents (1.10), and the 4-6 man tents (0.67).

With regard to specific environmental protection problems encountered, failure to protect adequately against the rain and cold were most often cited as problems in the 2 man tent, while failure to provide adequate protection from heat and dust were cited as the principal failings of the 4-6 man, 10 man, and larger tents.

In addition to specifying which tents had provided less than satisfactory protection from various environmental elements, respondents were asked in Question 4 if a tent fly or tent liner was needed for environmental protection in each of a number of different sizes of tents in a number of different environmental situations. Table 7 is a summary of the responses to Question 4 and indicates the percentage of responses indicating the necessity of inclusion of a fly, a liner, either a fly or a liner, or neither a fly nor a liner in each of the tents listed in each of the environmental conditions surveyed. Table 7 also provides a summary total percent of responses favoring each alternative as a sole function of tent size and a separate summary total percent of responses favoring each alternative as a sole function of environmental condition. Examination of the tent summaries which resulted from summing across environmental conditions indicates that, in all sizes of tents considered, neither a liner nor a fly was chosen as a necessity by the majority of respondents. When environmental conditions were considered without regard to tent size, the pattern of results was much the same. In four of the six environmental conditions, the category neither a fly nor a liner was the

Table 6

Reports of Inadequacies in Environmental Protection Afforded by Tents Expressed in Absolute Number of Reports and in Percentage of Reports

	2 MAN		4-6 MAN		10 MAN		LARGER	
Failed to protect against:	No. of Reports	% of Reports	No. of Reports	% of Reports	No. of Reports	% of Reports	No. of Reports	% of Reports
RAIN	44	(23%)	8	(17%)	12	(17%)	9	(18%)
SNOW	18	(8%)	7	(15%)	7	(10%)	4	(7%)
DUST	29	(15%)	9	(19%)	18	(23%)	12	(22%)
WIND	22	(11%)	3	(8%)	5	(7%)	7	(13%)
COLD	44	(23%)	8	(17%)	10	(14%)	10	(18%)
HEAT	31	(16%)	11	(23%)	18	(25%)	11	(20%)
SUN	8	(4%)	2	(4%)	3	(4%)	2	(4%)
TOTAL REPORTS OF FAILURE	184		48		71		55	
No. of Respondents w/Pertinent experience	81		55		58		50	
Mean No. of failure reports per eligible respondent	2.40		0.87		1.27		1.10	

Table 7

Percentage of Responses Indicating the Necessity for a Tent Fly, Tent Liner, Either or Neither as a Function of Tent Size and Climatic Condition

Climatic Conditions	2 MAN				4–6 MAN				10 MAN				LARGER				TOTAL % for Each Climatic Condition Summed Across Tents			
	Fly	F or L*	Liner	Neither	Fly	F or L*	Liner	Neither	Fly	F or L*	Liner	Neither	Fly	F or L*	Liner	Neither	Fly	F or L*	Liner	Neither
Wet-Warm or Hot-Humid	44%	0%	7%	49%	39%	0%	3%	58%	26%	0%	7%	67%	32%	0%	5%	62%	36%	0%	6%	58%
Desert or Hot-Dry	34%	0%	0%	66%	39%	0%	3%	58%	28%	0%	5%	67%	26%	0%	9%	65%	32%	0%	4%	64%
Temperate summer	29%	0%	5%	66%	33%	0%	5%	62%	23%	0%	5%	72%	24%	0%	3%	73%	28%	0%	4%	68%
Temperate winter	9%	7%	40%	45%	10%	7%	32%	51%	9%	2%	44%	44%	5%	5%	37%	53%	8%	6%	38%	48%
Arctic summer	8%	8%	10%	74%	11%	6%	14%	69%	11%	3%	16%	70%	9%	6%	18%	67%	10%	6%	14%	70%
Arctic winter	6%	2%	46%	46%	6%	0%	45%	48%	6%	0%	49%	46%	7%	3%	43%	47%	6%	1%	46%	47%
TOTAL % for Each Tent Summed Across Environmental Conditions	22%	3%	17%	57%	24%	2%	16%	58%	18%	1%	20%	61%	18%	2%	19%	61%				

*F or L = Fly or Liner

most common choice in terms of percentage of responses. However, for both the temperate winter and the arctic winter conditions, a liner alone was chosen almost as frequently as neither a fly nor a liner. It should also be noted that the fly alone received a somewhat increased percentage of choices when warm environments, wet warm, desert, and temperate summer were considered.

Space Requirements

Question 6 in the questionnaire presented estimates of the space afforded per man in an Army 2 man tent (17 sq ft/man), a 5 man tent (22.8 sq ft/man), and in a 10 man tent (20 sq ft/man). Respondents were asked to classify that amount of space as "too small", "about right", or "too large" as it applied to the adequacy of space in six different environmental situations. Table 8 presents a summary of the percentage of responses in each category as a function of tent size and environmental condition. Table 8 also presents the total percentage of responses for each size tent summed across different environmental conditions.

Table 8 makes it clear that there are substantial differences among different sizes of tents in the ratings of adequacy of space afforded per man. The 2 man tent was rated too small in the majority of responses. The 5 man tent, which currently provides the largest amount of room per man of the sizes tested, was rated adequate in its space allotment in the majority of the responses, while the 10 man tent was also rated about right, but not by as large a percentage as that obtained with the 5 man tent. There appear to be no major differences among adequacy of space afforded in different environmental situations. This is somewhat surprising in that it might have been anticipated that, in cold weather especially, the bulky clothing required would have increased the demand for space. Although this shift is reflected to some degree in the comparison of 2 man temperate winter with arctic summer, the same shifts are not as obvious in the 5 man and the 10 man tents. Apparently, the 2 man tent was generally thought to be too small, and the 5 man and the 10 man tents generally more adequate.

In order to complement the responses concerning square feet per man allotments of space, respondents were asked in Question 6 to state what percentage of floor space of each of a number of tents should permit standing erect. Table 9 presents the mean, median, and modal values of responses for each of the tent sizes included in the question. It is clear from Table 9 that, in all but the instance of the 2 man tent, all three measures of percentage of space which should permit standing erect correspond closely. In the command post and larger category of tents, it is obvious that the panel felt that 90 to 100% of the tent should permit standing erect. In the 10 man tent, the corresponding figures were 75 to 100%, and in the 4-6 man tent approximately 50%. With respect to the 2 man tent, the mode and median estimates specify 0% as the percentage of floor

Table 8

Percentage of Responses Indicating Adequacy of Space in Each of Three Sizes of Tents in Each of Six Environmental Conditions

	TENT SIZE									
		2 MAN			5 MAN			10 MAN		
	Space Estimate:	Too Small	About Right	Too Large	Too Small	About Right	Too Large	Too Small	About Right	Too Large
Environment:										
Wet-warm or Hot-humid		68%	32%	0%	26%	74%	0%	37%	61%	2%
Desert (Hot-dry)		60%	40%	0%	22%	78%	0%	36%	58%	6%
Temperate Summer		56%	44%	0%	21%	74%	5%	33%	63%	4%
Temperate Winter (Cold-wet)		66%	34%	0%	19%	81%	0%	36%	61%	2%
Arctic Summer		48%	50%	2%	20%	77%	3%	38%	59%	3%
Arctic Winter		58%	35%	6%	27%	63%	10%	43%	54%	4%
Totals Summed Across All Environmental Conditions		60%	39%	1%	22%	75%	3%	37%	60%	4%

Table 9

Mean, Median, and Mode Estimates of Percentage of Space within Each Tent Which Should Permit Standing Erect

	TENT SIZE				
	2 Man	4-6 Man	10 Man	Command Post	Larger
Mean	16%	52%	73%	90%	90%
Median	0%	50%	75%	100%	100%
Mode	0%	50%	100%	100%	100%

space in which one should be able to stand erect, while the mean reflects a relatively modest value of 16%. 0% therefore appears most representative of the panel's response to the 2 man tent.

In an effort to secure more specific information regarding space requirements, Question 7 was posed in which respondents were asked to state how long, wide, and high a 2 man tent should be. Answers to this question reflected the previously discussed results in that they indicated a general desire for a larger 2 man tent. Mean responses for length, height, and width for each of three major segments of the panel are presented in Table 10. It is clear from Table 10 that the expert civilian group recommended the smallest overall dimensions. The infantry panel recommended the next larger dimensions, particularly in the width dimension, while the engineers recommended the largest dimensions of all three groups. The reasons which might account for this particular ordering are not clear from the responses themselves. It might be hypothesized that since a large segment of the civilian panel was experienced in back-packing, they choose smaller tents amenable to that practice. Likewise, engineers who might have access to vehicles for carrying their tents might have chosen larger dimensions for that reason.

Section Summary

This section was intended as a more specific analysis of two of the problem areas identified in the Criteria and Preference Section of this report: 1) adequacy of environmental protection, and 2) adequacy of space.

With respect to these aspects, Tables 6 and 8 concerning adequacy of environmental protection and adequacy of space respectively, are most critical. In each instance, it was reported that the 2 man tent: 1) was cited most often among tents surveyed for failure to protect from the elements, and 2) was cited for inadequate space allocation for personnel and gear. The 4-6 man tent, however, was cited as least likely to fail to protect from the environment and was rated as adequate in space provided in approximately 75% of the responses. Ratings on the 10 man size tent tended to fall between the two extremes with a middle rating on failure reports concerning environmental protection and with approximately 60% of the responses expressing satisfaction with the space afforded in the tent.

It should be noted that, although the 4-6 and 10 man tents were rated somewhat above the 2 man tent in both critical areas, consideration can certainly be given to improvement of both tents. Both tents were criticized for a number of failures to adequately protect against environmental elements, most notably dust and heat. The latter criticism is consistent with the criticism of these tents noted in the Criteria and Preference Section regarding the tents becoming too hot in the sun and having inadequate ventilation.

Table 10

Mean Dimensions for 2 Man Tent Suggested by the Three Major Segments of the Panel

Panel Segment	Dimension Length	Width	Height
Infantry	7.88 ft	6.21 ft	4.28 ft
Engineers	8.17 ft	6.96 ft	5.17 ft
Civilian	7.80 ft	5.02 ft	4.18 ft

With respect to adequacy of space afforded, although 75% and 60% of responses approved of the space allocations in the 5 man and the 10 man tents, respectively, 22% of the responses related to the 5 man tent and 37% of the responses related to the 10 man tent expressed the opinion that the space allocation was too small.

SECTION III

Human Factors and Habitability

The following two subsections represent summaries of results relating to various human factors considerations and to the habitability of the various tents surveyed. The first subsection deals with factors relating to ease of erection and striking of the tent, one of the three major areas of concern identified in Section I. The second subsection considers the ease of use-habitability factor.

Erecting, Striking, Packing the Tent

The soldiers and civilian experts were asked in Question 8 to state problems encountered in unpacking, erecting, striking, and packing various sizes of tents. In Question 9, the panel was asked to suggest changes or methods which would alleviate problems encountered or make it easier to unpack, erect, strike, and pack a tent.

Fig. 5 gives the percentage of responses falling into each of seven major complaint areas which emerged in the analysis of the responses to Question 8. The percentage of responses which indicated that no problem existed is also illustrated. It should be noted that the percentages of responses within each tent size are once again based upon different numbers of responses due to differences among the respondents in experience with the various sizes of tents.

The pattern which emerges in all sizes of tents indicates that problems with the tent equipment itself, rather than any single environmental problem, were the greatest sources of difficulty encountered. Problems with the tent itself were followed, in order of magnitude, by cold weather difficulties, difficulty at night, and problems associated with wet weather.

Among the 2 and the 4-6 man tents, the principal complaint related to tent equipment was the large number of loose parts which had to be assembled and packed and which became lost. Among the 10 man and larger size tents, the primary equipment-related problems concerned both the heavy weight and the bulk of the tents. Too much hardware to be assembled was also cited frequently as a source of difficulty. It is of interest to note that loss of parts and the large number of parts also constitute principal problems

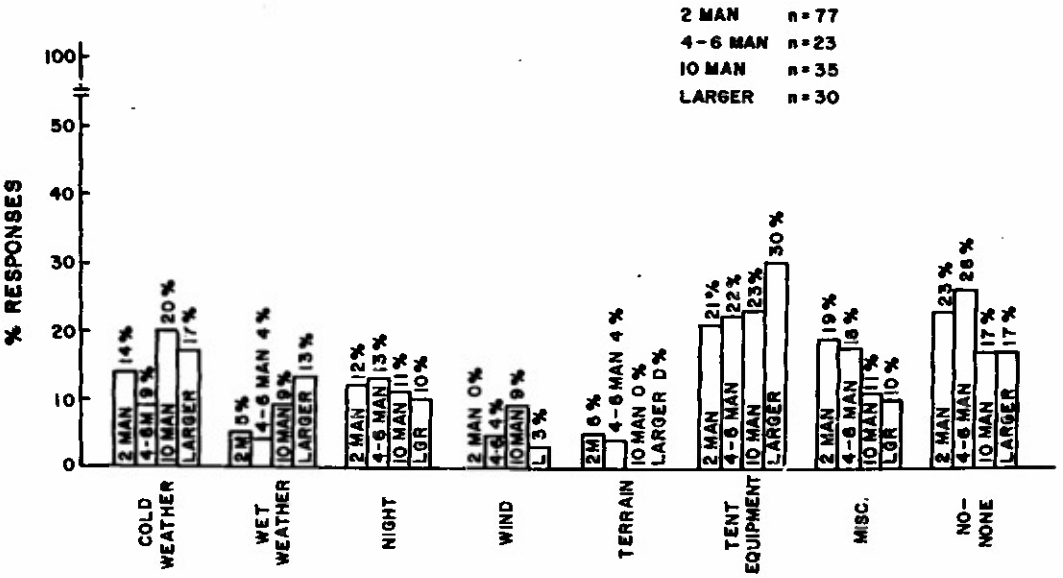

FIG. 5 PROBLEMS IN UNPACKING, ERECTING, STRIKING & PACKING TENTS

included under the "night" label in Figure 5. In this instance, the night factor apparently interacted with the factor of too many parts to confound difficulty associated with the latter. The heavy weight and bulk of the 10 man and larger tents apparently incurred a large manpower requirement during erecting and striking.

Within all sizes of tents, the most common problem related to environmental factors were those encountered in the cold. Principal among the cold related problems were driving pegs into frozen ground, the difficulty in handling small parts while wearing protective gloves, and the lack of pliability of tent materials in the cold.

A more complete listing of responses to the question regarding problems of erecting, striking, and packing is given in Table II of the Appendix.

Fig. 6 gives the percentage of responses falling into each of the six major suggestion areas which emerged in the analysis of recommendations to alleviate difficulties in erection, striking, and packing. The percentage of responses in which no suggestion was made is also illustrated. The percentage of responses within each tent size is again based upon different numbers of responses due to differences among the sample in experience with various sizes of tents.

Analysis of the response patterns in Fig. 6 indicates that these patterns do in fact reflect the major problems in erecting, striking, and packing discussed above. Loss of parts and the large number of parts was a principal complaint concerning 2 and 4-6 man tents. As illustrated in Fig. 6, the most frequent suggestion relating to these sizes of tents was to adopt captive frames and hardware. The most frequent suggestion concerning the 10 man and the larger tents, cited for their heavy weight in the problem analysis, was to adopt materials or frames which would lighten them. The only other major suggestion made with respect to all sizes of tents, that of adoption of pliable materials, was in apparent reference to the cold environment problem cited previously.

Ease of Use

Eight questions included within the questionnaire surveyed the opinions of the panel with respect to several factors related to ease of use and habitability of the various sizes of tents. In the ease of use analysis, respondents were asked to supply information regarding the adequacy of entry/exit openings. The habitability factor was assessed by means of questions regarding the desirability of a floor, mosquito netting, ventilation openings, and various colors; and by information regarding provisions for drying clothing, installation of stoves, etc., to be included in the various sizes of tents.

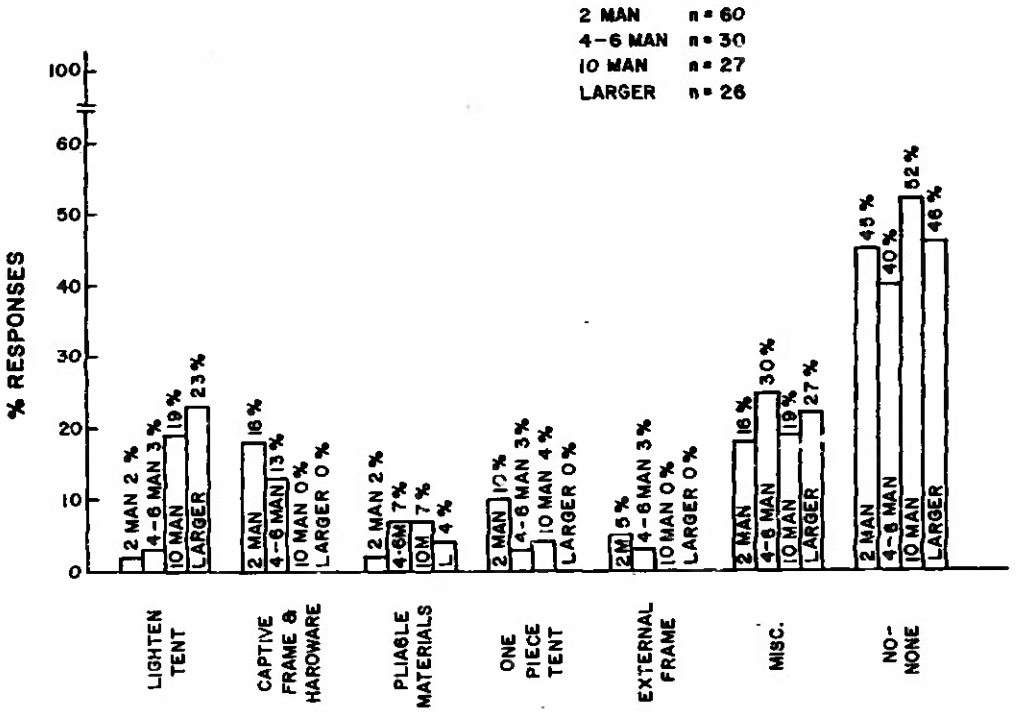

FIG. 6 SUGGESTED CHANGES TO MAKE TENTS EASIER TO ERECT, STRIKE AND PACK

Ease of Use – Entry Exit Openings

Fig. 7 presents the percentage of responses to Question 11 suggesting the number of entry/exit openings for each size tent. Category specification such as "2, 2+" indicates the percentage of respondents who recommended two openings or two plus an unspecified number of additional openings. In every instance cited, the plus figures represent a very minimal portion of the percentage of responses listed.

It is clear from Fig. 7 that two entry/exit openings is the most frequently suggested number of openings for all sizes of tents surveyed. The 2 man tent represents the only instance in which the preference for two openings is not marked. In this instance, 43% of the respondents expressed a preference for one entry/exit opening and 57% a preference for two openings. Based upon the results of this analysis, it would appear that two entry/exit openings are considered the optimal number by the panel.

A related question, Question 12, sought to assess the overall adequacy of current entry/exit openings which the respondents had had occasion to use. Table 12 presents the percentage of affirmative and negative responses to this question regarding the adequacy of entry/exit openings. It is clear that the majority of respondents felt that the entry/exit openings in each size of tent were adequate. Those respondents who felt that the openings were inadequate were asked to specify particular problems which had led them to rate the openings as inadequate. Table 13 presents the percentage of these respondents who noted particular inadequacies.

Regardless of tent size, reported inadequacies dealt with two major areas: 1) difficulty incurred because of the size of the opening, and 2) difficulty with closure of the entry/exit opening. The most common complaint regarding opening size across all tents indicated that the exits were too small for ease of entry and exit. Difficulties with closure of the entry/exit opening in the dark and failure to achieve a tight closure with the current system were principal among the complaints associated with all sizes of tents. Complaints regarding specific closure materials were few in number. However, snaps and buttons on 2 man tents and the slide canvas closure in larger tents were noted as sources of difficulty by at least one respondent in each case.

With regard to the adequacy of closure materials, the sample of soldiers and civilian experts was asked to specify in Question 14 which type of closure materials they felt was best for use with each size of tent. Fig. 8 presents the percentage of each of six major closure materials which emerged as most frequently chosen in an analysis of the responses to this question.

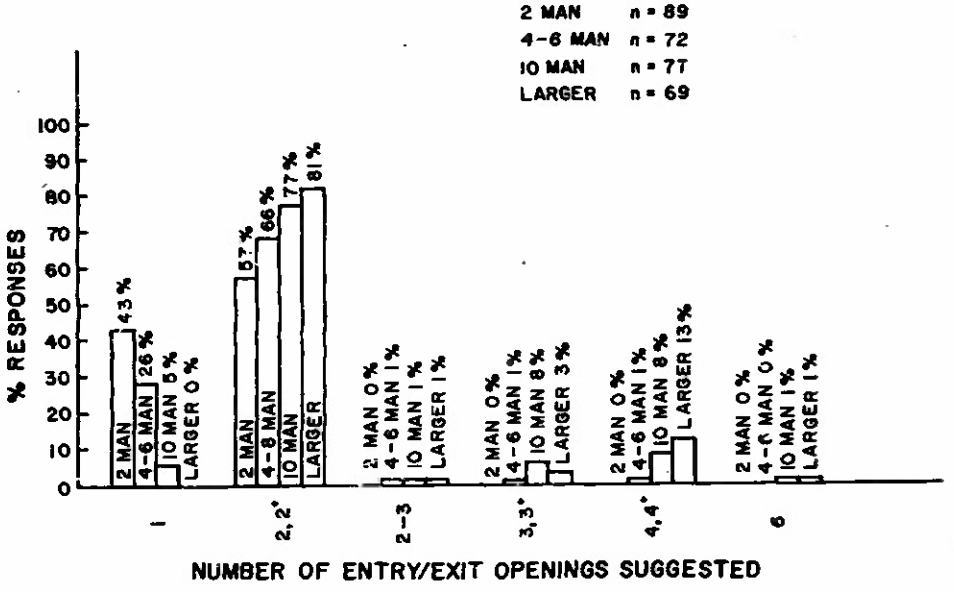

FIG. 7 NUMBER OF ENTRY/EXIT OPENINGS SUGGESTED FOR EACH SIZED TENT

Table 12

Percentage of YES and NO Responses to the Question:
Are Entry/Exit Openings Adequate?

Response	2 Man (n=78)	4-6 Man (n=38)	10 Man (n=41)	LARGER (n=35)
YES	74%	84%	80%	71%
NO	26%	16%	20%	29%

Table 13

Percentage of Responses Noting
Particular Inadequacies in Entry/Exit Openings

	Tent Size			
Inadequacy	2 Man	4-6 Man	10 Man	Larger
Difficulty with Exit Closure	52%	20%	40%	60%
Inadequate Size of Openings	48%	60%	60%	40%
Miscellaneous	–	20%	–	–

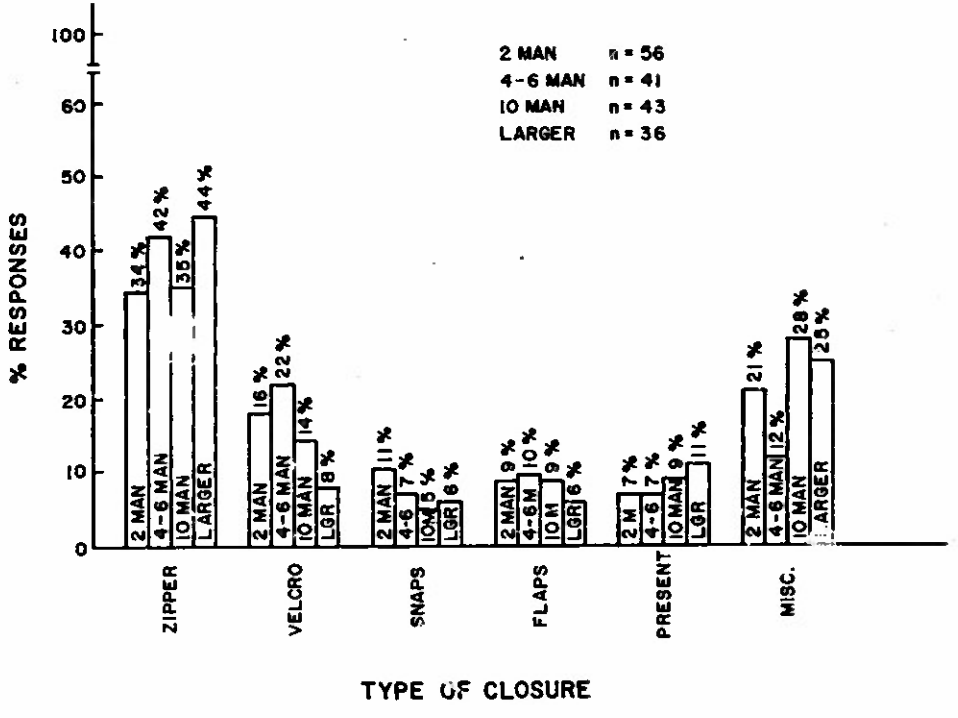

FIG. 8 BEST CLOSURE MATERIAL FOR ENTRY/EXIT OPENINGS

It is apperent from Fig. 8 that the zippel type closure is the preferred meteriel in ell sizes of tents. The velcro type closure represents the second most preferred closure. The respondents apparently felt thet e zipper or velcro type closure would alleviate their reported difficulties in the dark end would echieve e tight closure.

Question 15 was included in order to determine respondents' opinions regarding the necessity of light-proof double doors in e tent used as a commend post. Sixty members of the penel felt that they had sufficient military experience to respond to the question. Of those responding, 57% felt thet lightproof double doors were elweys necessary, 23% felt that they were usually necessary, 15% felt that they were sometimes necessary, end 5% felt that they were never necessery. According to the mejority of the respondents to this questio.., an edequete entry/exit opening for e commend post tent would require tha lightproof double door design.

Ease of Use — Habitability

As indicated previously, the habitability of each size tent was essessed by e group of five questions releted to comfort of the tent. Fig. 9 illustrates the percentage of respondents who replied positively or negatively to Question 10 which esked if tents should have floors. Inspection of Fig. 9, mekes it clear thet e mejority of respondents favor inclusion of e floor in ell sizes of tents. However, it is also evident that the size of the tent has e definite effect on the number of respondents expressing such e preference. Inclusion of a floor in the tent was most preferred in the 4-6 end the 2 men tents. The size of the mejority preferring the floor decreesed es the 10 man end larger tents were considered. Respondents offered exolanetions for their positive or negative enswers end e summery of these comments is included in Table 14 in the Appendix.

It is clear from Teble 14 thet the primary reesons for preferring e floor in tents of ell sizes include en increesed protection from ground weter or dempness, wermth, and protection from insects or rodents. Increese in weight end bulk wes the principel reeson offered for e preference to not have e floor included in e tent. With the 10 men and larger size tents, the opinion tnet cots would be used for sleeping in most instances and the concern expressed for the durebility of the floor end en inebility to treffic heavy equipment through the tent were edditionel considerations expressed in justification of negative responses regarding inclusion of e floor.

Fig. 10 shows the percentage of responses to Question 16 specifying the numbers of ventiletion openings for use in the verious sizes of tents. The respondents preferred an even number of openings in all cases. Two openings were preferred for the 2 man tent end two or four were preferred for the 4-6 men tent. When the 10 men tent is

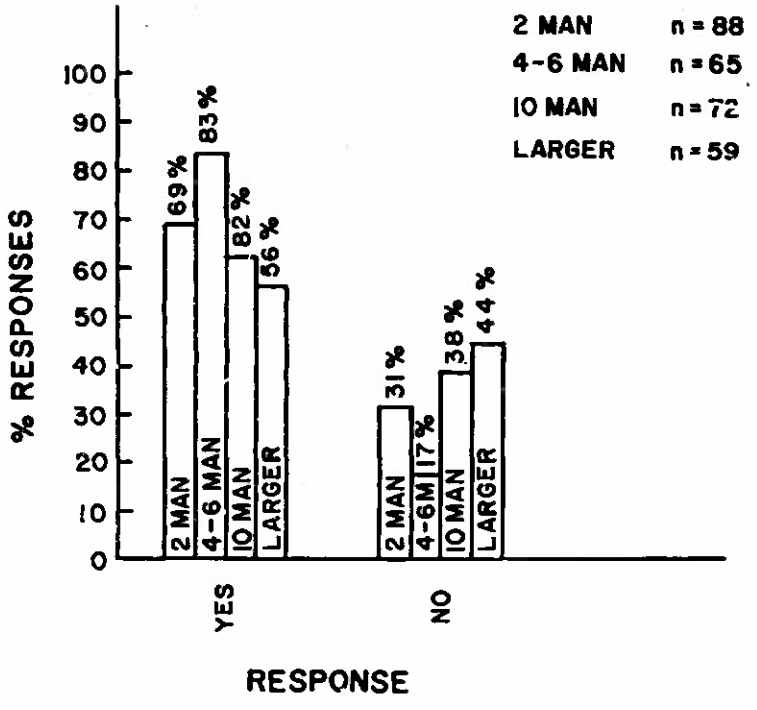

FIG. 9 PERCENTAGE OF RESPONSES FAVORING OR NOT FAVORING INCLUSION OF FLOORS IN VARIOUS SIZES OF TENT

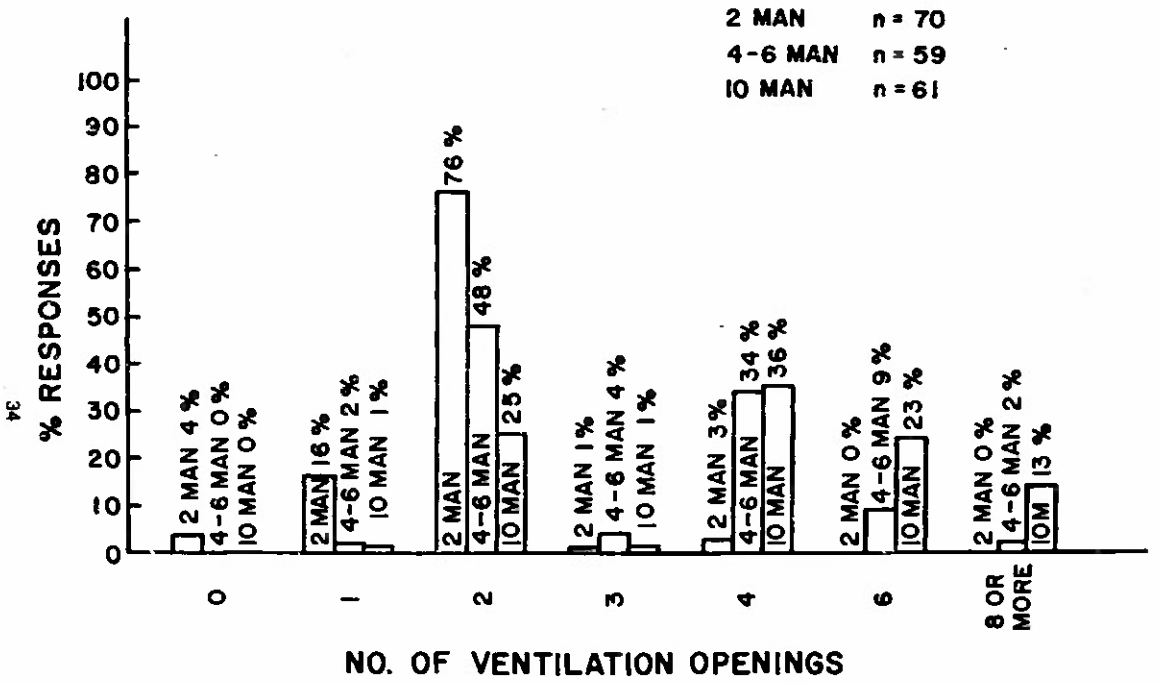

FIG. 10 NUMBER OF VENTILATION OPENINGS REQUIRED IN EACH SIZE TENT

considered, respondents distributed their choices fairly equally among two, four, and six ventilation openings. Although more respondents chose four openings as optimal, the choice of a definite preference is not as clear-cut in this instance as in others.

Related to the adequacy of ventilation question is the extent to which doors and windows in tents can be used to provide ventilation, in addition to serving their other functions, without incurring the penalty of introduction of mosquitoes and other bothersome and potentially disease-ladden insects into the internal environment of the tent. Respondents were asked in Question 13 if, in their opinion, mosquito netting for tent doors and windows was necessary for comfort and health under various environmental conditions in each of four sizes of tents.

The answers across all conditions differed very little from tent to tent. The mean value across the four tents and six climatic conditions were 60% positive and 40% negative responses. Differences between tents were small, the percentage of positive responses being lowest (58%) for the 2 man tent and highest (63%) for the 10 man tent. Differences between climatic conditions were relatively large. Table 15 summarizes the percentage of positive and negative responses in reference to each climatic condition.

To test an acceptance factor related to habitability, Question 16 required respondents to specify the color that they would prefer inside each of the various size tents. Fig. 11 shows the percentage of respondents who expressed a preference for each of the six colors which emerged as most popular in the analysis.

A green interior gained most support from respondents. White was the only other color mentioned in a high percentage of cases, but in most instances, the green was preferred to white by a two-to-one margin. It would appear from the results of this question that the largest segment of the panel would be satisfied with the green color, although it is notable that, even in this case, less than half the respondents chose the green.

In an additional consideration of the habitability factor, respondents were asked in Question 17 what provisions should be made in tents for drying clothing, installing stoves, or providing other essential functions. An analysis in terms of those answers favoring inclusion of provisions for drying clothing or for installing stoves vs. those not favoring inclusion of such provisions is presented in Table 16.

It is apparent from Table 16 that inclusion of provisions for both installing stoves and drying clothing is not favored by the majority of respondents with respect to 2 man tents. In the 4-6 and the 10 man tents, the pattern is completely reversed. The lack of positive responses with respect to the 2 man tent may be an indication that respondents felt that a stove and drying facilities were not feasible or were unnecessary in a 2 man

Table 15

Percentage of Responses Favoring or Not Favoring Inclusion of Mosquito Netting in All Sizes of Tents in Various Climatic Conditions

Climatic Condition	% of Responses	
	YES	NO
Hot-humid	94%	6%
Temperate Summer	89%	11%
Desert	79%	21%
Arctic Summer	51%	49%
Temperate Winter	18%	92%
Arctic Winter	6%	94%

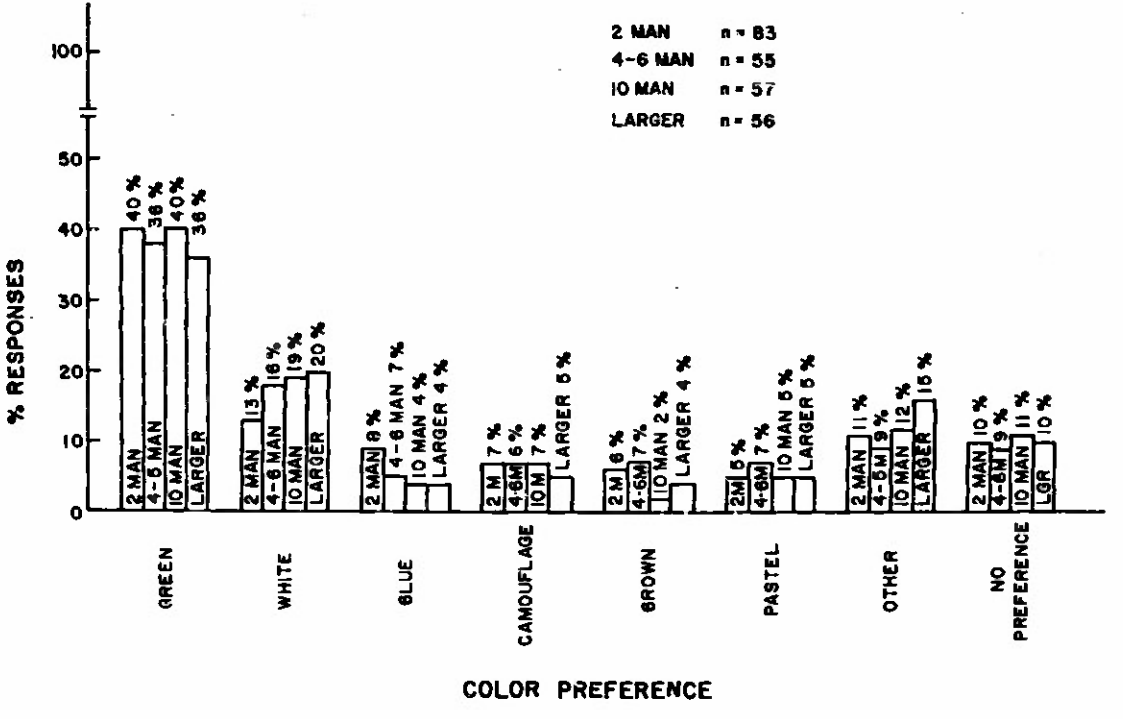

FIG. 11 COLOR PREFERENCE FOR INSIDE OF TENT

Table 16

Percentage of Responses Favoring or Not Favoring Inclusion of Provisions for Installing Stoves and Drying Clothing in Tents

	TENT SIZE					
	2 MAN		4–6 MAN		10 MAN	
	Positive Response	Negative Response	Positive Response	Negative Response	Positive Response	Negative Response
Installing Stove	26%	74%	72%	28%	88%	12%
Drying Clothing	34%	66%	67%	33%	73%	27%

tant. Previous analyses presented (Tables 3, 5, and 6) have indicated that protection from cold was a significant area of concern in 2 man tents. It might be hypothesized that the respondents felt that the 2 man tent afforded inadequate space for inclusion of a heater or clothes drying capability or that sleeping gear, addition of a floor, etc., were viewed as the principal means of providing or improving the thermal comfort afforded by the 2 man tent.

Principal among the recommendations for installation of a stove in the 4-6 and the 10 man tents were a ceiling vent for stove pipe, adequate room for stove installation, the recommendation that the stove be small, and the suggestion that a hole in the floor or partial floor be provided at the site of the stove installation.

Suggestions related to provisions for drying clothing in the 4-6 man and 10 man tents can be conveniently grouped into two major categories. One suggested that adequate space be permitted for drying of clothes within the tent, while the other consisted of recommendations of various suspension devices. Lines or drop lines were the preferred suspension device, with a variety of hooks, loops, hangers, and O-rings mentioned with second greatest frequency as the preferred means of suspension.

In response to a portion of the question which requested information regarding provisions for any other functions which they considered essential, more room for equipment storage and the request for more room in general were the only consistent recommendations across all sizes of tents.

Section Summary

The analysis of the problems of erection, striking, and packing and the recommendations for their alleviation indicated three major areas of concern: 1) the multiple number of loose parts which become lost, complicate assembly, and contribute to difficulty in erection at night; 2) the weight and bulk of the 10 man and larger sizes of tents which make these tents difficult to handle and which incur a substantial manpower commitment; and 3) the problems associated with erection in the cold, such as difficulty in driving pegs, lack of pliability of materials, and difficulty in handling small parts with protective gloves.

Responses to questions regarding the ease of use of entry/exit openings indicated that two openings were the preferred number across all sizes of tents and that the majority of respondents felt that current entry/exit openings were adequate. Those respondents who reported difficulties with entry/exit openings specified two major sources of difficulty: 1) operation of the closure material in the dark and inability to gain a tight closure; and 2) inadequate size of exits for ease of entry and exit.

The data from various questions designed to assess the habitability factor led to the general conclusions that the largest percentage of respondents favored inclusion of floors in all sizes of tents surveyed, preferred a green interior color, favored inclusion of mosquito netting when responses were averaged across six climatic conditions, and responded positively to inclusion of provisions for installing stoves and drying clothing in 4-6 and 10 man tents, but not in the 2 man tent. These conclusions are, of course, general and must be somewhat tempered by such realizations that although floors were preferred by a majority of respondents for all sizes of tents, the majority progressively diminished as larger tents were considered, and that, although mosquito netting was preferred when the average across all climatic conditions was considered, there were certain climatic conditions in which this was not the case.

The results of this section, then, serve to identify major problem areas reported by respondents with regard to the erection, striking, and packing of tents, indicate difficulties with respect to the ease of use of entry/exit openings, and provide a guideline for consideration of inclusion of certain habitability factors in tents.

SECTION IV

Design, Materials and Repairs

The first and third divisions of this section are a report of the results of a series of questions designed to elicit recommendations concerning the optimal design and materials which might be incorporated into future tentage. The second division of this section deals with data developed to assess the adequacy of current tentage repair items and to gain recommendations for improvement in repairs capability.

Optimal Type of Support

In an effort to evaluate the best type of support which could be provided in tents, respondents were asked to state preferences in four questions dealing with 1) the best support without regard to a specific function, 2) the easiest support to back pack, 3) the easiest support to erect, strike, and pack, and 4) the best type of support for several specific functions to be performed inside the tent.

Responses to Question 22 regarding the best type of support without reference to a specific function are summarized in Fig. 12. It is clear from Fig. 12 that the inside and outside frame supports are preferred to the pole type of support in all these sizes of tents. An outside frame support is the preferred support in 2 man tents, and an inside frame the preferred support among 10 man tents. The inside and outside frame supports are approximately equal in preference among the 4-6 men tents.

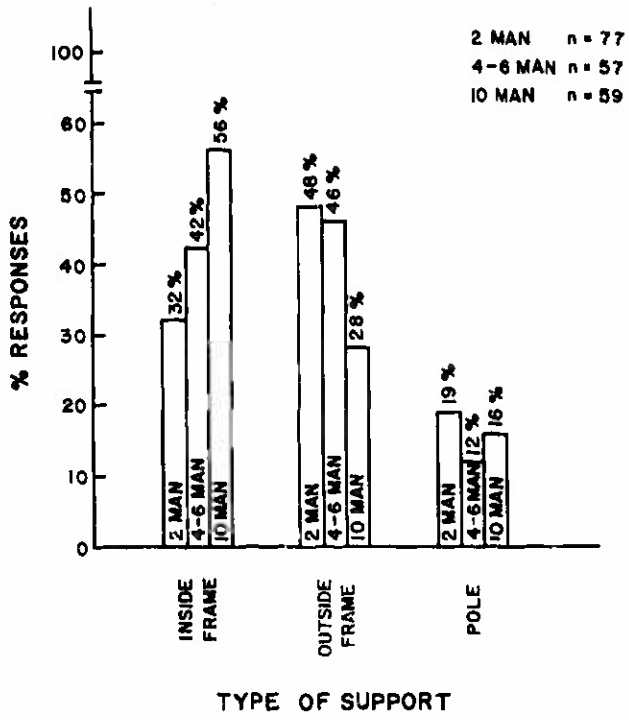

FIG. 12 PERCENTAGE OF RESPONSES FAVORING EACH TYPE OF SUPPORT AS BEST IN TENTS

With respect to more specific functions, respondents to Question 23 were asked to specify which support they preferred to back-pack. Question 24 required respondents to specify which support was judged most convenient to pack, unpack, erect and strike. Tables 17 and 18 summarize the data from these questions.

Pole supported tents were clearly judged easiest to back pack in the two man tent and were also the choice of the majority of respondents in 10 man tents. The outside frame tent was judged easiest to back pack in the 4-8 men range. Choice of the outside frame in the 4-6 man size tent as easiest to back pack, although by only a small percentage, is somewhat surprising in that the frame would be expected to be heavier and bulkier than a pole support of comparable materials. The data offer no means of assessing what considerations led the respondents to rate the outside frame as highly as they did in this case.

The responses to Question 24 regarding the ease of packing, striking, erecting, and unpacking the various sized tents produced mixed results as is evidenced in Table 18. The pole supported was rated superior among the 2 men tents, but not by a substantial margin, over the two frame tents. Among the larger sizes of tents, frame types were generally preferred to pole tents. However, with the exception of the 4-6 man data, the differences between types of support were minimal. With the exception of the 4-6 man size tents, therefore, the data of Table 18 provide no clear basis of choice of one type of support over another.

Fig. 13 is a summary of the percentage of respondents who preferred each of the various types of support for each of six functions which might be performed in a tent.

The outside frame was the preferred support for each function listed in Fig. 13. The inside frame was second most preferred in each instance, while the pole support was least preferred in each case. The only exception to clear support of the outside frame is with regard to the command post, where the inside frame and the outside frame were chosen an approximately equal number of times.

Maintenance and Repair

In an attempt to gain information regarding the current ability to repair tentage in the field, questions were asked about the availability of tent repair kits and their adequacy. Reaction to the concept of a permanently attached repair kit was also evaluated.

In response to Question 19 regarding the availability of repair kits, 14% of the respondents answered affirmatively, 48% negatively, 34% stated they did not know if kits were available, and 3% indicated that kits were sometimes available. The pattern of responses to this question would make it appear that repair kits are either not readily available in the field or are not highly visible if they are available.

Table 17

Percentage of Responses Specifying Each Type of Support as Easiest to Back Pack

Type of Support	2 Men n=61	4–6 Men n=36	10 Men n=34
Inside Frame	23%	25%	24%
Outside Frame	28%	42%	35%
Pole	49%	33%	41%

Table 18

Percentage of Responses Specifying Each Type of Support as Easiest to Pack, Unpack, Erect, and Strike

Type of Support	2 Men n=71	4–6 Men n=43	10 Men n=44	Larger n=31
Inside Frame	30%	40%	39%	35%
Outside Frame	31%	42%	31%	35%
Pole	39%	19%	31%	29%

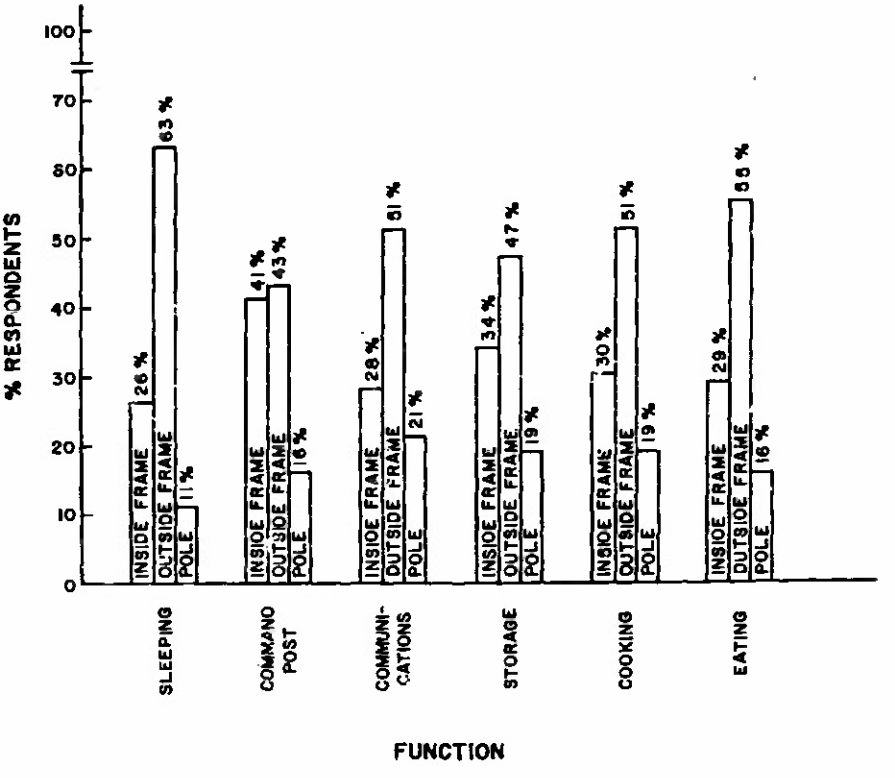

FIG. 15 PERCENTAGE OF RESPONDENTS PREFERRING EACH TYPE OF SUPPORT FOR EACH OF THE FUNCTIONS SPECIFIED

Whan asked, in Question 20, to evaluate the adequacy of current kits, when eveilabla, 25% of tha respondents with kit exparience indicated that tha kits ware adequate, 15% felt the kits were not edequate, 1% indicated that the kits were sometimes adequeta, end 59% felt unabla to eveluate adequacy. Those individuals who felt that tha kits were inadequeta were asked to specify reasons for tha inadequacy or were esked to meke recommendations for improvements of the kit. Tha majority of recommendations centered upon the need for new adhesive for inclusion in the repair kits. The current cement was rated unservicable, missing, or of inadequete quentity by some respondants, whila others expressed e desire for a patch thet could be used with cold-wet materiels or for self-edhesive repair tape. The need for e larger kit with mora repair itams and for a zipper repair kit wes also expressed.

Table 19 presents e summary of responses to Question 21 concerning whether tents should have permenently attechad repair kits. It is clear thet, in aach case, inclusion of a permanently attached repeir kit is favorad by e majority of respondents. Tha concept receives more substantial support as the size of tha tent considered increases.

Respondents were esked to comment on their repiies. Reasons citad in support of inclusion of repair kits included lack of nexessity to turn the tent in for repeir, ability to prevent small taars from becoming lerger, and the opinion that repair kits were often left in supply.

Objections to inclusion of permenent repair kits included the opinion thet ona kit should be sufficient for mora than one tent, end the expectation thet the lerger tents would be used in ereas close to supply.

Design and Materials

The number of panel members asked to respond to the quastions which comprise this section wes limitad since it was felt that these questions required considereble knowledge of tent design and materials. It was therefore decided to limit responses to thase questions to those panel members who were expectad to be most knowladgeabla concerning this subject. Therefore, the data reported in this section era unique in comparison with other results in this report in that these date ere based upon responses solicited from only 13 of tha experts on tha penel — the five mountain club members, the five tant manufacturers, end the three milltery members of the panel from the U.S. Army Natick Leboretorias. It should be noted thet not all tha axperts responded to every quastion in this section, causing some veriability in the number of responses referenced in discussion of aach quastion.

Table 19

Percentage of Responses Indicating a Preference Regarding Permenently Attached Repair Kits on Tents

Response	Tent Size 2 Man	4-6 Man	10 Man
YES – Repair Kit should be attached	63%	77%	84%
NO – Repair Kit should not be attached	24%	12%	11%
Don't Know	14%	11%	5%

In response to Question 27, which asked the best shape for various sizes of tents, a majority of the respondents (5 of 7) favored the traditional rectangular tent with an A-shaped top. The others favored a half-circular cylinder or a design that was higher at one end than at the other. For the 4-6 man and 10 man tents, the majority of the six respondents preferred the rectangular A-shaped tent in each instance.

Question 26 was designed to determine what types of materials the experts considered best for various sizes of tents which were to be man-transportable. Rip-stop nylon or dacron was unanimously chosen as the best material for the 2 man tent, and six of seven respondents chose rip-stop nylon or dacron for the 4-6 man tent. For the 10 man tent, three preferred dacron or nylon duck, one preferred army duck, one preferred 7 oz. polyester, and one was undecided.

Respondents were asked to state their preferences regarding the best material for tent floors. Coated rip-stop nylon or dacron was unanimously preferred as the best floor material for the 2 man tent, and vinyl coated rip-stop nylon was preferred by seven of eight respondents for the 4-6 man tent floor. Half of the group of eight respondents believed that the 10 man tent should not have a floor, and the others preferred a floor of vinyl coated dacron or nylon. For the larger tents, a majority of the seven respondents were opposed to having a fabric floor. Those not opposed to the floor preferred vinyl coated dacron or nylon as the floor material.

In Question 30, the expert panel was asked what type of material would be optimal for tent pegs for various sizes of tents. Eleven expressed opinions on the best material for pegs for the 2 man tent — five preferred aluminum, four preferred plastic, and two preferred steel. Results for the 4-6 man tent were almost the same; five preferred aluminum, four preferred plastic, and three preferred steel. Aluminum pegs were preferred for the 10 man tent by three individuals, plastic by one, steel by three, and wood by one. Wood and steel pegs were each preferred for the larger tents by three individuals, two preferred aluminum, and one preferred plastic.

One common response to Question 31, which asked the best method for attaching a tent to anchors, was guy-lines with adjustors and shock cord loops. This arrangement was recommended for 2 man, 4-6 man, 10 man, and larger tents, as were ropes with adjustable locks and polypropylene rope. Nylon cord with shock cord also was recommended for all except the larger tents. Metal grommets or steel rings, ties, elastic loops, and shock cord with a loop for the peg were recommended for 2 and 4-6 man tents. Other recommendations were slip lines with some shock absorbing ability, ties for use with 10 man and larger tents, the use of grommets and buckets to attach pegs to the tent floor, and ropes between poles and pegs.

Section Summary

The data reported concerning the optimal support for tentage without regard to specific functions indicated that the outside frame was preferred in the 2 man tent, an inside frame was the choice in the 10 man tent, and that respondents chose the inside and outside frame tents an approximately equal number of times in the 4-6 man size. With respect to back-packing, pole supported tents were judged superior to others in the 2 man and 10 man sizes, while the outside frame was chosen more frequently than the remainder in the 4-6 man category. The percentage of responses specifying each type of support as easiest to erect, strike, and pack were mixed in the 2 man, 10 man, and larger sizes of tents. In the 4-6 man size, both the inside and outside frames were preferred to the pole support, but the choice between the two preferred frames was not apparent. Responses to a question regarding specific functions to be performed in a tent generally favored the outside frame tent for each of the specific functions listed.

The responses to the optimal support section, then, present no basis for choice of one type of support as superior to the others with respect to all functions. Frame tents appear to be chosen with greater frequency when functions to be performed inside the tent are discussed, but pole-supported tents were chosen as easiest to back-pack in two of the three tent sizes considered. Choice of support, therefore, apparently depends upon that function or factor considered to be of overriding significance.

Analysis of the data of the maintenance and repair section suggested that repair materials for tentage are either not readily available in the field or are not highly visible if available, for a large percentage of respondents did not know if repair kits were available in the field or felt that they could not adequately evaluate the quality of the kits. A possible method of alleviation of this problem, permanently attached repair kits, was favored by the majority of respondents in all sizes of tents considered.

The majority of the thirteen expert members of the panel chosen to respond to the design and materials section preferred the rectangular A-shaped tent in all sizes. Rip-stop nylon or dacron was specified by a majority as the best material in the 2 man and the 4-6 man tents, while coated rip-stop nylon or dacron and vinyl coated rip-stop nylon were the choices as best floor materials in the 2 man and 4-6 man tents, respectively. Choices of best material for tentage were mixed for the 10 man tent and were divided between no floor and vinyl coated dacron or nylon as the choice for flooring in the 10 man tent.

APPENDIX

Table 4

Detailed Responses to Question 1 – Aspects Liked Best about Tentage

–2 Man Tents–

Protection from Environment (21%)	n	%
Dry, waterproof, protects against rain	6	6
Protection from weather	4	4
Easily warmed	3	3
Good ventilation	2	2
Floor	2	2
Stable in wind	2	2
Other	3	3

Ease of Erection, Striking, Packing (63%)	n	%
Easily erected	25	24
Easily struck and folded	3	3
Light weight	22	21
Small, compact	7	7
Easily carried, portable	10	9

Adequate Space (8%)	n	%
Adequate size, roomy, for personnel and gear	6	6
Floor area unobstructed	2	2

Miscellaneous (8%)

–4–6 Man Tents–

Protection from Environment (36%)	n	%
Dry, waterproof, protects against rain	5	11
Floor	2	4
Easy to heat, warm	3	6
Well ventilated	4	9
Other	3	6

Table 4 (cont'd)

—4–6 Man Tents—
(cont'd)

Ease of Erection, Striking, & Packing (26%)

	n	%
Easily eracted	6	17
Light weight	2	4
Folds into convenient size, compact	2	4

Adequate Space (23%)

	n	%
Roomy	5	11
Easy movement, minimum inside pole, or outside frame	4	9
Living area edequate	2	4

Miscellaneous (15%)

—10 Man Tents—

Protection from Environment (47%)

	n	%
Weterproof, dry, protects ageinst rain	3	7
Good protection from elements	3	7
Werm, easily heeted	10	22
Good ventiletion	3	7
Little wind	1	2
No dust	1	2

Ease of Erection, Striking, & Packing (22%)

	n	%
Easily erected	7	15
Sturdy, once erected	1	2
Light weight	1	2
Easily packed	1	2

Adequate Space (18%)

	n	%
Roomy, adequate for personnel and equipment	6	13
Ease of movement inside; No center poles	2	4

Miscellaneous (13%)

Table 4 (cont'd)

—Larger Tents—

	n	%
Protection from Environment (48%)		
Waterproof, protects against rain	4	13
Warm, ability to be heated	6	16
Sturdy in snd protects against wind	2	6
Weather resistant, protects against elements	2	6
Roll sides up w/netting for summer	1	3
Not necessary to sleep on ground	1	3
Ease of Erection, Striking, & Packing (3%)		
Easily erected	1	3
Space (26%)		
Adequate space for personnel, equipment and work	8	26
Miscellaneous (23%)		
Easily repaired and maintained	2	6
Other	6	16

Table 5

Detailed Responses to Question 2 – Aspects Liked Least about Tentage

–2 Man Tents–

Failure to Protect from Environment (33%)	n	%
Leaks – not waterproof	14	11
No floor or protection from ground water	12	9
Poor heat retention	5	4
Other	11	9

Difficulty in Erection, Striking, and Packing (21%)	n	%
Too heavy	13	10
Difficult to erect	3	2
Too many parts	3	2
Other	8	6

Inadequate Space or Space Arrangement (40%)	n	%
Space inadequate for personnel and gear	42	33
Poles placed inconveniently	3	2
Insufficient height	4	3
Other	2	1

Miscellaneous (5%)

–4–6 Man Tents–

Failure to Protect from Environment (31%)	n	%
Lack of protection from rain	4	8
No floor or protection from ground water	2	4
Tent is hot in sun – poor ventilation	5	10
Other	4	8

Difficulty in Erection, Striking, Packing (35%)	n	%
Difficult or complex to erect	5	10
Time to erect	1	2
Difficult to strike	1	2
Too heavy	8	16
Too bulky	2	4

Table 5 (Cont.)

Inadequate Size or Space Arrangement (10%)

	n	%
Too small for personnel and gear	2	4
Other	3	6

Miscellaneous (24%)

	n	%
Drying time and difficulty in storage when wet	2	4
Other	10	20

—10 Man Tents—

Inadequate Protection from Environment (38%)

	n	%
Tent leaks — not waterproof	3	5
No floor — protection against ground water	5	8
Too hot in sun — poor ventilation	6	10
Inadequate protection from wind, blown dust and rain	6	10
Other	3	5

Difficulty in Erection, Striking, and Packing (44%)

	n	%
Difficult, complex to erect	13	21
Too heavy	6	10
Too bulky and large	4	7
Too many parts	2	3
Other	2	3

Inadequate Size (8%)

	n	%
Too small	3	5
Other	2	3

Miscellaneous (10%)

—Larger Tents—

Failure to Protect from Environment (29%)

	n	%
Tent leaks	2	4
Does not protect against ground water	3	5
Rain, dust blow in, sides blow up	3	5
Too warm in sun, cold in the cold	4	7
Canvas doesn't breath	2	4
Other	2	4

Table 5 (Cont.)

	n	%
Difficulty in Erection, Striking, Packing (59%)		
Difficult, complicated to arect, store	8	14
Too much time to arect	3	5
Too heavy	11	20
Bulky, too large	7	13
Too much manpower, too difficult to handle	2	4
Other	2	4
Miscellaneous (11%)		

Table 11

Specific Problems in Erecting, Striking, and Packing Tents

—2 Man Tents—

	n	%
Cold Weather (14%)		
Material – brittle, not pliable in cold	3	4
Equipment difficult to operate w/cold hands or mittens	4	5
Stakes difficult to drive into frozen ground	2	3
Other	2	3
Wet Weather (5%)		
Difficult to erect in rain	4	5
Night (12%)		
Parts difficult to locate, difficult to see peg holes, small parts lost easily at night	9	12
Terrain (5%)		
Stakes don't hold in soft ground	2	3
Ground too hard to drive stakes	1	1
Finding suitable ground for poles	1	1
Tent Equipment (21%)		
Too many parts and stakes	3	4
Locating small parts for assembly	4	5
Loose (unsecured) tent equipment	3	4
Other	6	8
Miscellaneous (19%)		
Crew training and experience	3	4
Breaking and rolling into halves	4	5
Other	8	10
None (23%)		

Table 11 (Cont.)

—4—6 Men Tents—

	n	%
Cold-wet weather (13%)		
Difficult to drive stakes in frozen ground	1	4
Ropes difficult to undo in the cold or wet	1	4
Tent material not pliable in the cold	1	4
Night (13%)		
Difficult at night	3	13
Terrain (4%)		
Poles not suitable for terrain	1	4
Tent Equipment (22%)		
Too many loose parts to locate, assemble, and pack	4	17
Too heavy to be handled easily	1	4
Wind (4%)		
Wind	1	4
Miscellaneous (18%)		
Manpower requirement	2	9
Other	2	9
None (26%)		

—10 Man Tents—

	n	%
Cold Weather (20%)		
Difficult at sub-zero	1	3
Tent material not pliable for packing, etc.	5	14
Difficult to drive stakes in frozen ground	1	3

Table 11 (Cont.)

Wet weather (9%)

	n	%
Ropes difficult to undo when cold or wet	1	3
Too heavy when wet	2	6

Night (11%)

	n	%
Difficult at night due to no. of poles and stakes	4	11

Wind (9%)

	n	%
Wind makes erection difficult	3	9

Tent equipment (23%)

	n	%
Too large – size makes hard to handle	3	9
Too heavy to be handled conveniently (by a few men)	2	6
Too much hardware to be found and assembled – requires too many men	3	9

Miscellaneous (11%)

	n	%
Manpower requirement	1	3
Requires trained crew for facility	1	3
Other	2	6

None (17%)

–Larger Tents–

Cold weather (17%)

	n	%
Tent materiel brittle in cold	2	7
Difficult to drive pins into frozen ground	1	3
Difficult to handle small items w/gloves	1	3
Difficult at night in sub-zero	1	3

Wet weather (13%)

	n	%
Difficult or inconvenient to erect in rain and mud	3	10
Ropes hard to undo in cold or rain	1	3

Table 11 (Cont.)

	n	%
Night (10%)		
Difficult to erect at night	1	3
Lights a necessity for erection at night	2	7
Equipment (30%)		
Too large – difficult to handle	4	13
Too heavy to be handled conveniently (by a few men)	3	10
Too much hardware – poles, pegs	2	7
Miscellaneous (13%)		
Too much time required for erection, etc.	1	3
Tent poles did not remain straight in wind	1	3
Other	2	7
None (17%)		

Table 14

Specific Reasons for Favoring or Not Favoring Inclusion of Floors in Various Sizes of Tents

–2 Men Tents–

Favorable Comments (82)

	n	%
Warmth	9	11
Protection from ground water or dampness	36	44
Protection from insects and rodents	13	16
For protection while sleeping on ground	6	7
For protection from wind	5	6
Other	13	16

Unfavorable Comments (23)

	n	%
Too much bulk and weight would be added	6	26
Ponchos can be utilized for the purpose	3	13
Not need	5	22
Other	9	39

–4–6 Men Tents–

Favorable Comments (70)

	n	%
Warmth	6	11
Protection from ground dampness or water	31	44
Protection from insects and rodents	10	14
Protection from wind	5	7
For sleeping on ground	5	7
Other	11	16

Unfavorable Comments (9)

	n	%
Too much bulk and weight added	3	33
Not need or necessary	2	22
Other	4	44

Table 14 (Cont.)

Favorable Comments (57)

	n	%
Warmth	6	11
Protection from ground dampness or drainage	26	46
Protection from insects and rodents	5	9
Comfort and unspecified protection	4	7
Protection from wind	3	5
Other	13	23

Unfavorable Comments (23)

	n	%
Use cots the majority of the time	7	30
Would involve increases in weight and bulk	4	17
Too difficult to clean	2	9
Other	10	43

—Larger Tents—

Favorable Comments (41)

	n	%
Protection from ground dampness or water	19	46
Warmth	6	15
Comfort and unspecified protection for man and his equipment	4	10
Protection from rodents and insects	3	7
Keep equipment and inside clean	2	5
Other	7	17

Unfavorable Comments (29)

	n	%
Most of time, sleep on cots	6	21
Increased weight and bulk	9	31
Questionable floor durability and consequent expected repair	2	7
Unnecessary	6	21
Difficult to clean	2	7
Consequent inability to traffic heavy equipment through	2	7
Other	2	7

QUESTIONNAIRE ON MAN-PORTABLE FIELD SHELTERS

Prepared by the Human Factors Group

US ARMY NATICK LABORATORIES

INTRODUCTION

The Army is initiating development of a new integrated family of shelters to provide environmental protection for military personnel in the field. The US Army Natick Laboratories have been assigned the responsibility for developing a family of portable field shelters which can be back-packed when necesaary, without undue strain on the soldier. These shelters will include a one or two man tent, another for 4 to 6 men, a general purpoae ten man tent, and a Command Post tent with space for about ten men.

The Human Factors Group at NLABS is atudying problems related to the deaign, construction and uae of these shelters, including their habitabilily, the human needs they must satisfy, the protection they furniah the aoldier and his equipment, and their suitability for the military activities which will be conducted in them.

Interviewa are being held and this questionnaire ia being circulated to aecure additional information and opinions regarding tent and shelter characteristics and aa yet unaolved problems. Your cooperation in answering the queationa which follow will be appreciated. You are urged to volunteer additional information and to comment freely on any problems which you think are important. You are not expected to answer any queation which is outside of your experience or knowledge. Leave any such questiona blank.

AMXRE Form 526 (One-Time)
15 Dec 72

Personal Data

Name: _____ Rank or Title _____ Date _____
Last, First Initial

Name of Organization: _____

Address: _____ Phone _____

Age: _____ Height: _____ Weight: _____ Suit coat size: _____

Civilian Occupation: _____

Years of Military Service: _____ MOS No. _____ MOS Title: _____

Years of experience designing tents: _____

Years of experience manufacturing tents: _____

Months of experience using tents under the conditions below:	Exploring expeditions	Military Use	Family Camping	Mountain Hiking	Other
Wet-warm or hot-humid:					
Desert (Hot-dry):					
Temperate Summer:					
Temperate Winter (Cold-wet):					
Arctic Summer:					
Arctic Winter (Extreme cold-dry):					

Circle size and type of tents used: 2 man, 4-6 man, 10 man, larger tents.
Name or describe briefly
the tents used: _____

If appropriate, please make additional comments on your experience with tents:

_____

_____

Have you ever carried a tent on a parachute jump? YES No . If your answer was YES, describe your experience in jumping with the tent:

_____

_____

_____

Desirebls General Criteria for Tents Designad for Back-Packing

Listed below are a number of criteria which can be applied to tents designed to be back-packed and used in all climatic conditions. Read sach statement and decids how necessary and important aach characteristic is in an ideal bac:-packsd all-weather tent. Then choose the sight most important characteristics from among thass lieted on this page and mark each with a check in the spacs provided. After you have checked 8 statements, MAKE A SECOND CHECK OPPOSITE THE FOUR MOST IMPORTANT OF THE 8 CHECKED STATEMENTS.

____Light weight, even whsn wet.

____Small bulk whsn packaged for shipping.

____Small bulk when folded for carrying.

____Protects soldier against environmental stresses.

____Tent material is flame resietant.

____Easy exit in cass of firs or attack.

____Easily & quickly srscted and struck with availablo tools.

____Convsnisnt to handle and adjust.

____Right size for the number of occupants, thair gsar, and the functions to be performed in the tent.

____Protects stowed squipment from damags by the anvironment.

____Eesy to maintain and kssp clean.

____Adsquate ventilation, svsn in rainy weather.

____Tent is dureble snough for six months continuous field uss.

____Illumination is edsquate for activities to be performed in the tent, day or night.

____Adequate blackout provisions.

____Affords or permits suitable camouflage, world-wide.

____Tsnt has good military appearanco.

____Tent is stable in the wind.

____Tent materials do not complicate wounds.

____Tsnt is suitable for many uaaa.

HAVE YOU CHECKED 8 STATEMENTS AND DOUBLE-CHECKED 4 STATEMENTS ON THIS PAGE?

Specific Criteria and Design Features for Tents Designed for Back-Packing

Listed below are a number of more specific criteria which can be applied to tents designed to be back-packed and used in all climatic conditions. Read each statement and decide how necessary and important that characteristic is in an ideal back-packed all-weather tent. Then choose the sixteen most important characteristics from among those listed on this page and the next and mark each with a check in the space provided. After you have checked 16 statements, MAKE A SECOND CHECK OPPOSITE THE 8 MOST IMPORTANT OF THE 16 CHECKED STATEMENTS.

____Tent protects soldier against rain.

____Tent protects soldier against ground water.

____Tent protects soldier against snow.

____Tent protects soldier against wind.

____Tent protects soldier against mosquitoes and other insects.

____Tent protects soldier against snakes.

____Tent helps to keep the soldier warm in the cold.

____Tent helps to keep the soldier cool in heat and sunshine.

____Tent is compatible with standard load-carrying equipment.

____Tent provides for drying clothes inside.

____Tent has two exits.

____Tent is easy to patch and repair.

____Tent closures are easy to operate with arctic handwear.

____Tent closures work reliably at extreme sub-zero temperatures.

____Tent furnishes desireable visual environment.

____Tent is quiet.

____Tent material is free from unpleasant odors.

____Tent can be erected on any terrain.

____Tent can be erected quickly, even in the dark.

____Tent has minimum number of stakes and ropes.

(CONTINUED ON NEXT PAGE)

Specific Criteria (Continued).

_____Tent has maximum inside space, unobstructed by poles.

_____Tent can be moved from place to place, fully assembled.

_____All tent poles or frame members are standard and maximally interchangeable.

_____All other tent hardware and parts are standard and interchangeable.

_____All hardware, tent pegs, and other parts are "captive" to prevent loss.

_____Shock-cord suspensions are used to improve the resistance of tent to wind.

_____Tent hardware and parts do not become brittle, even at extreme sub-zero temperatures.

_____If the tent has a floor, there is a drain or zippered opening in the floor.

_____Tent floors are waterproof and durable.

_____All tent materials are highly water repellent, but the walls breathe to prevent condensation.

_____Minimum increase in weight when tent is wet.

_____The tent material is mildew resistant.

_____The physical characteristics of the tent material are minimally affected by long periods of outdoor exposure.

_____The weight and strength of tent materials are minimally affected by processing, finishing, and treatments.

_____All hardware, closures, and small parts are corrosion resistant.

_____All hardware, closures, and small parts are lightweight.

_____Color inside the tent is not objectionable to users.

_____Tent fabric remains flexible at extreme sub-zero temperatures.

_____Tent has no unfavorable emotional impact on occupants.

_____Tent provides for cross ventilation, when needed.

HAVE YOU DOUBLE CHECKED THE 8 MOST IMPORTANT STATEMENTS ON PAGES 4 & 5?

1. List two or more things you have liked best about each size tent which you have used. Cross out sizes which you have not used. Name tents if possible.

   2 man: _____

   4-6 man: _____

   10 man: _____

   Larger tents: _____

2. List two or more things you have disliked most about each size tent you have used. Cross out sizes which you have not used. Name tents if possible.

   2 man: _____

   4-6 man: _____

   10 man: _____

   Larger tents: _____

3. Place a check-mark in each column for each size tent which failed to protect you against:

(Cross out sizes you have not used)

	2 man	4-6 man	10 man	larger
rain:				
snow:				
dust:				
wind:				
cold:				
heat:				
sun:				

If any tent failed to protect in any way, How? _____

_____

How do you think the inadequacy can be remedied? _____

_____

_____

4. Is a tent fly or tent liner needed for each size tent under each of the following conditions? Cross out sizes of tents not used and conditions not experienced. In each remaining space where you think a tent fly or liner would be needed, write "fly" or "liner", depending on which you consider best for that condition and size tent.

	2 man	4-6 man	10 man	Larger
Wet-warm or hot-humid:				
Desert (Hot-dry):				
Temperate Summer:				
Temperate Winter (Cold-wet):				
Arctic Summer:				
Arctic Winter (Extreme cold-dry):				

5. The three Army tent sizes listed below at the right provide the amount of floor space indicated for each man and his equipment (weapon and personal gear).

Under each of the conditions listed below at the left, do you consider the amount of space per man for each size tent to be "too large", "too small", or "about right"? Check your answer for each tent used under each condition experienced.

Tent size:	2 man			5 man			10 man		
Sq. ft. of floor area per man:	17			22.6			20		
	Too small	About right	Too large	Too small	About right	Too large	Too small	About right	Too large
Wet-warm or hot-humid									
Desert (Hot-dry)									
Temperate Summer									
Temperate Winter (cold-wet)									
Arctic Summer									
Arctic Winter (Extreme cold-dry)									

6. In your opinion, what percentage of the floor space of each of the following tents should permit standing erect?

2 man: _____ %.

4-6 man: _____ %.

10 man: _____ %.

Command Post: _____ %.

Larger tents: _____ %.

7. How long do you think a 2 man tent should be? _____

How wide? _____. How high? _____

8. Were there any problems in unpacking, erecting, striking and packing tents of the following sizes, particularly at night, in the rain, or at sub-zero temperatures? Cross out tent sizes not used. List the worst problems first. (Continue on back if you need more space.)

2 man: _____

4-6 man: _____

10 man: _____

Larger tents: _____

9. Can you suggest any changes, coding schemes or new methods which would make it easier to unpack, erect, strike, and pack tents of the following sizes, particularly at night, in the rain, or at sub-zero temperatures?

2 man: _____

4-6 man: _____

10 man: _____

Larger tents: _____
More efficient methods of erecting 10 man and larger tents would be particularly

useful. _____

10. In your opinion, should the size tents listed below have floors? In each row, answer by circling "Yes" or "No". Then tell why you gave that answer.

2 man: YES NO Why? _____

4-6 man: YES NO Why? _____

10 man: YES NO Why? _____

Larger tents: YES NO Why? _____

11. How many openings should each size tent have for entry and exit?

2 man: _____

4-6 man: _____

10 man: _____

Larger: _____

12. Are the entry/exit openings provided in tents you have used adequate in size, shape, and type of closure? Cross out tent sizes not used. If inadequate, how are they unsatisfactory?

2 man: YES NO _____

4-6 man: YES NO _____

10 man: YES NO _____

Larger: YES NO _____

13. In your opinion, is mosquito netting for tent doors and windows necessary for comfort and health under the following conditions? Answer Y(es) or N(o).

	Wet-warm or hot-humid	Desert (Hot-dry)	Temperate Summer	Temperate Winter (cold-wet)	Arctic Summer	Arctic Winter Extreme (cold-dry)
2 man:						
4-6 man:						
10 man:						
Larger tents:						

14. What type(s) of closures do you think are best for entry/exit openings of tents intended for world-wide use in each of the sizes?

2 man: _____

4-6 man: _____

10 man: _____

Larger tents: _____

15. If a tent is to be used as a Command Post, how important are lightproof double doors? Circle one answer. (Omit this question if you have not had military experience).

ALWAYS NECESSARY USUALLY NECESSARY SOMETIMES NECESSARY NEVER NECESSARY

16. In your opinion, how many ventilation openings should there be and where should they be located in each size tent intended for world-wide use?

	Number	Location
2 man:	_____	_____
4-6 man:	_____	_____
10 man:	_____	_____

17. In each of the following tent sizes, what provision should be made for: drying clothing, installing stoves, & other essential functions?

2 man:	_____	_____	_____
4-6 man:	_____	_____	_____
10 man:	_____	_____	_____

18. What color would you prefer for the inside of each tent? (White, pastel colors, brown, blue, green, gold, red, black, and yellow, or other color.)

2 man: _____

4-6 man: _____

10 man: _____

Larger: _____

19. Are tent repair kits actually available in the field when needed to repair minor damage which sometimes occurs to tentage? (Draw a circle around your answer.)

YES NO DON'T KNOW

20. Are present tent repair kits adequate? Circle answer: YES NO DON'T KNOW
What additional improvements are needed?

_____

_____

21. In your opinion, should the following size tents have a small, light-weight, permanently attached repair kit? Circle one answer in each row.

COMMENTS

2 man: YES NO UNCERTAIN _____

4-6 man: YES NO UNCERTAIN _____

10 man: YES NO UNCERTAIN _____

22. Check one answer in each row to indicate what you think is the best type of support for a:

	Inside frame	Outside frame	Pole type	No difference	No opinion
2 man tent:					
4-6 man:					
10 man:					

23. In your opinion, which type of tent of each size would be easiest to back-pack? Check one answer in each row.

	Inside frame	Outside frame	Pole type	No difference	No opinion
2 man:					
4-6 man:					
10 man:					

24. In your opinion, which type tent of each size would be easiest to unpack, erect, strike, and pack? Check one answer in each row.

	Inside frame	Outside frame	Pole type	No difference	No opinion
2 man:					
4-6 man:					
10 man:					
Larger tents:					

25. Tents are commonly used for specific purposes such as those listed at the left. Add any other specific uses and then check your opinion of the best type of tent support for each purpose:

	Inside frame	Outside frame	Pole type	No difference	No opinion
Sleeping:					
Command post:					
Communications:					
Storage:					
Cooking:					
Eating:					

26. List any ways (not previously mentioned) in which you think the size tents which you have used could be improved. Continue on back if you need more space.

2 man: Used Not used. _____

4-6 man: Used Not used. _____

10 man: Used Not used. _____

27. What do you think is the best shape for a:

2 man tent? _____

4-6 man tent? _____

10 man tent? _____

28. Man-transportable tents of the sizes listed below are needed for use under all conditions of climate and terrain. In your opinion, what would be the best material for each size? Be as specific as possible.

2 man: _____

4-6 man: _____

10 man: _____

29. In your opinion, what would be the best floor material for tents of each of the following sizes? (Answer "None" for any size which should not have a floor.)

2 man: _____

4-6 man: _____

10 man: _____

Larger: _____

30. Which material (wood, steel, plastic, aluminum, or other) do you think would be the best for tent pegs for use with the following sizes of man-transportable tents?

2 man tent: _____

4-6 man: _____

10 man: _____

Which material would be best for pegs to use with larger tents? _____

_____

31. In your opinion, what is the best method for attaching a tent to anchors?

2 man: _____

4-6 man: _____

10 man: _____

Larger tents: _____